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# Van Sangyan

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We welcome the readers of Van Sangyan to write to us about their views and issues in forestry. Those who wish to share their knowledge and experiences can send them:

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The articles can be in English, Hindi, Marathi, Chhattisgarhi and Oriya, and should contain the writers name, designation and full postal address, including e-mail id and contact number.

TFRI, Jabalpur houses experts from all fields of forestry who would be happy to answer reader's queries on various scientific issues. Your queries may be sent to The Editor, and the expert's reply to the same will be published in the next issue of Van Sangyan.

**Cover Photo:** Panoramic view of Achanakmar-Amarkantak Biosphere Reserve

**Photo credit:** Dr. N. Roychoudhury and Dr. Rajesh Kumar Mishra, TFRI, Jabalpur (M.P.)

## From the Editor's desk



*Neem Tree has been described in Ayurveda's prime text, the Charaka Samhita, as sarva roga nivarini (that which keeps all diseases at bay) or arishtha (reliever of disease). Its extracts have been used in the Ayurvedic tradition for thousands of years for maintaining health and overall well-being. The roots, bark, gum, leaves, fruit, seed kernels and seed oil are all used in therapeutic preparations for both internal and topical use. Neem (Azadirachta indica A. Juss) tree commonly seen and available in India everywhere yet, only a few are aware about neem and know that it is an integral part of Ayurveda for the benefits associated with it. The beneficial properties of Neem (Azadirachta indica A. Juss) have been recognized in the Indian tradition for thousands of years. Each part of the Neem tree has some medicinal property. It is an herb that is commonly available, throughout the year and has benefits that only a few natural products can provide.*

*Neem is known by many different names, Nimm, Arya Veppu, Azad Dirakht, DogonYaro, Neeb, Nimtree, Vepu, Vempu, Vepa, Bevu, Kohomba, Vembu, Tamar, Paraiso, Antelaea azadirachta, Arishta, Arishtha, Azadirachta indica, Bead Tree, Holy Tree, Huile de Neem, Indian Lilac, Indian Neem, Lilas des Indes, Lilas de Perse, Margosa, Margosa Tree, Margousier, Margousier à Feuilles de Frêne, Margousier d'Inde, Melia azadirachta, Neem Oil, Neem Tree, Melia azadirachta, Nim, Nimb, Nimba, Persian Lilac, Pride of China. In East Africa it is also known as Muarubaini (in Swahili), which means the tree of the 40, as it is said to treat 40 different diseases.*

*Neem has anti- bacterial; anti- parasitic, anti- fungal, anti-inflammatory and analgesic properties that not only benefits your health but can help you get rid of common beauty problems that you face in your daily life. All parts of neem are used for preparing many different medicines, especially for skin disease. Neem leaf is used for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems. The leaf is also used for birth control and to cause abortions. Various parts of the Neem tree have been used as traditional Ayurvedic medicine in India. Neem oil and the bark and leaf extracts have been therapeutically used as folk medicine to control leprosy, intestinal helminthiasis, respiratory disorders, constipation and also as a general health promoter. Neem which is rich in Vitamin C also helps in getting rid of skin problems like blackheads, pigmentation, dullness and ageing thus leaving the skin with a youthful glow.*

*In line with the above this issue of Van Sangyan contains an article on Medicinal importance of Neem (Azadirachta indica). There are other useful articles viz. Traditional healing practices of tribal healers, Horse Gram: A multipurpose crop, Mashrooms and their importance, पलाश: औषधीय गुणों वाला एक दुर्लभ वृक्ष (in Hindi), सीबकथोर्न: स्टोर हाउस ऑफ विटामिन्स(in Hindi) and Biodiversity of Grewia optiva and Coturnix coturnix.*

*I hope that readers would find maximum information in this issue relevant and valuable to the sustainable management of forests. Van Sangyan welcomes articles, views and queries on various such issues in the field of forest science.*

*Looking forward to meet you all through forthcoming issues*

**Dr. R. K. Verma**  
Scientist 'G' & Chief Editor

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## Medicinal importance of Neem (*Azadirachta indica*)

Moses Fayiah<sup>1</sup>, Salia Sowa<sup>2</sup> and Muloma Seibatu Kallon<sup>3</sup>

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### Abstract

Neem plant is considered as the poor man's drug pharmacy in Africa and is gaining widespread acceptance especially in rural areas. This study seeks to evaluate the medicinal uses of Neem (*Azadirachta indica*) plants in four selected villages in Kori - Chiefdom. A random sampling method using a well-structured questionnaire was used to conduct this study. 50 respondents were targeted in the four selected villagers. Others data collection techniques such as group discussion and observations were employed. Over 75% of the respondents affirmed that the Neem plant medicinal ability is unquestionable. Sicknesses such as malaria, fever, wounds, ringworm, dysentery, vomiting, scabies, toothache, Impotency, high-blood pressure, upset, smallpox, snakebite, pile and constipation were among the sickness cured by using the Neem plants. Besides the medicinal use, other uses were; beautification, pesticides, energy, shade and habitat to birds. It is recommended that more awareness raising campaign be instituted to educate the public about the medicinal importance of Neem and hence encourage private and public organizations to embark on massive planting of the species country wide.

**Key words:** Neem, Medicinal, plant, sicknesses, cure.

### Background

The neem (*Azadirachta indica*) is a tropical evergreen tree native to Indian sub-continent (Roxburgh, 1874), but also grown in Africa Australia and America (Shirish, 2010; Mandal and Deb Mandal, 2011). Neem has been adopted throughout much of the tropics; its wide geographic spread is in part due to its ability to grow quickly, rooting deeply into a variety of soils (ideally sandy) and for its notable persistence under very harsh conditions such as drought, high temperatures high soil acidity and climate change (Mineard, 2010; NRC 1992; Smith,1997; Lal, 2004)It is currently cultivated in Sierra Leone, Liberia, Mauritania, Senegal, Kenya, Gambia, Guinea, Ivory Coast, Ghana, Burkina Faso, Mali, Benin, Niger, Nigeria, Togo, Cameroon, Chad, Ethiopia, Sudan, Somalia, Tanzania, Mozambique, Uganda and Bostwana. Neem is an omnipotent tree and a sacred gift of nature and is a member of the mahogany family, Meliaceae. The plant has for many years been used extensively by man to treat various sicknesses before the availability of written records which recorded the beginning of medicinal history (Kumar and Navaratnam 2013). *A. indica* has been well known in India and its neighboring countries for more than 2000 years as a versatile medicinal plant with a broad spectrum of biological activity, including antibacterial properties. Currently, it is regarded as the most useful traditional medicinal plant in India, and known as the

“village pharmacy.” Almost every part of the tree has found applications in indigenous medicine for the treatment of various human ailments, including those due to bacterial infection (Mandal and Deb Mandal, 2011). Traditional Neem preparations from all parts of the tree, including the bark, roots, flowers, and seeds, have been used for centuries for medical, agricultural (pest control agent and fertilizer), hygienic, and cosmetic purposes (Ujvary, 2010). In Sierra Leone however, it is mostly grown in rural areas by mostly traditional healers in their private backyards and homes (People.pers.com).

#### **Medicinal role of neem (*Azadirachta indica*) in developing countries**

Neem (*Azadirachta indica*) is considered harmless to humans, animals, birds, beneficial insects and earthworms (Pankaj, 2011). The antibacterial, insecticidal antifungal and other biological activities of these Neem products are well established. Neem also has a remarkable effect on chronic skin conditions and hair. Other

effects are Acne, psoriasis, eczema, ringworm and even stubborn warts are among the conditions that can clear up very easily when high quality, organic Neem oil is used (Kumar and Navaratnam, 2013). In Africa, India, Burma, Asia etc., alcohol removed from the leaves and barks of Neem plant are effective antimalarial drugs and have significant control as effective as quinine on malaria (Pankaj, 2011). Neem oil have been use to control various skin infections. Neem seed and leave extracts are effective against both chloroquine resistant and sensitive strain malaria parasites (Mackinnon et al., 2002). The world health organization (WHO) estimates that 80% of the population living in the developing countries relies exclusively on traditional medicine for their primary health care. More than half of the world's population still relies entirely on plants for medicines, and plants supply the active ingredients of most traditional medical products (Kumar and Navaratnam, 2013).

Table 1: Medicinal uses of Neem

<b>Plant part</b>	<b>Medicinal uses</b>
Leaf	Leprosy, eye problem, epistaxis, intestinal worms, anorexia, biliousness and skin ulcers
Bark	Analgesic, alternative and curative of fever.
Flower	Bile suppression, eliminative of intestinal worms and phlegm.
Fruit	Piles, intestinal worms urinary disorder, epistaxis, phlegm, eye problem
Twigs	Cough, asthma, piles, phantom tumor, intestinal worms spermatorrhoea, obstinate urinary disorder, diabetics,
Gum	Scabies, wounds, ulcers, skin disease
Seed	Leprosy and intestinal worms
Oil	Leprosy and intestinal worms

**Source modified:** Biswaset, *al.* (2002),

### Other uses of neem plant

Neem products have been proven to have no ill effects on human beings as well as animals nor have they any residual effect on agricultural produce. This makes neem the best, reliable substitute to hazardous pesticides. The demand for chemical pesticides will be reduced by large scale use of Neem based pesticides that will in turn reduce the load of synthetic chemicals in our environment (Ogbuewu et al., 2011). Pesticides from Neem are easy to prepare, less expensive but highly effective source for important pesticides for mostly poor countries farmers (Brahmachari, 2004). According to Tanzubil, (1996) pollinating insects, bees and other useful organisms are mostly not affected by pesticides from Neem. According to Satish, (1998) the massive planting of Neem trees will help prevent desertification, reduce soil erosion, cushion deforestation effects and help mitigate climate change. Ogbuewu (2011) believes that Neem in agro-forestry can produce benefits like shade, timber, firewood, windbreaks, and can acts as shelterbelt in the semi-arid zone of Northern Nigeria. The temperature under the Neem has been found to be  $\sim 10^{\circ}\text{C}$  less than the surrounding temperature, during hot summer months in the northern parts of India. In India Neem oriented toothpaste used widely across the country and even beyond. In other parts of the world, Neem has been a source of many oral-hygiene and dental curing. The bark of Neem yields gum and tannins which are used in tanning, dyeing and many more functions. Neem seed pulp is used as a rich source of carbohydrate in fermentation industries and for methane gas production (Ogbuewu, 2011).

Massive reforestation with Neem species is gaining widespread attention in Africa but sluggishly being adopted in Sierra Leone. However, recent development and projects geared towards establishing and researching the multiple benefits of Neem in Sierra Leone has been kicked started at Njala University and is currently on going. Before this time, Neem trees can only be seen in compounds, along roads and around dwelling areas within Kori Chiefdom, Moyamba District but no research work has been carried out to assess its medicinal value impacts in these communities. Never the less, the medicinal properties and importance of the Neem trees is still rudimentary to many in the Chiefdom especially the rich class. This research therefore seeks to close the gap of how important Neem plant are in terms of medicinal values and what sicknesses are these plant use to cure within the four selected villages in Kori Chiefdom. Such information is vital for its widespread establishment and cultivation in Sierra Leone.

### Methodology

#### Description of study area

The research was conducted in four villages within Kori Chiefdom, Moyamba District. They include: Mosongo, Bonganema, Mokonde and Foya. Kori Chiefdom is one of the largest Chiefdoms in Moyamba District with a population of 280,910 (Statistics Sierra Leone, 2015). It is geographically located along the South-Northern region. Kori Chiefdom lies between latitude  $7^{\circ}\text{N}$  and longitude  $11^{\circ}\text{W}$ , with maximum temperature between  $20^{\circ}\text{C}$  and  $32^{\circ}\text{C}$ . The average rainfall for the entire Moyamba district is 2,750mm (Metrological Department, 1990). The Chiefdom experiences dry seasons from November to April and raining seasons



from May to October each year. The vegetation belt comprises mainly forest, fresh water swamps or inland valley swamp and an extension biomes of which some time could be used for rice cultivation arable cropping and vegetable production (Jusu, 1990). The moderately fertile soil consists of a well-balanced mixture of sand, clay and humus (Kanneh, 2009).

#### Sample design and data collection

The random sampling method without replacing was used to solicit information from respondents. A total of 50 respondents were selected from the four villages within Kori Chiefdom. About 20 respondents were randomly selected from Mosongo, 12 from Mokonde, 10 from Bonganema and 8 from Foya village respectively. The difference in the number of respondents per village was due to the population as well as the village size. A well-structured questionnaire was used to solicit information on the topic of research in June, 2015. Additional information was obtained from personal observation and group discussions with the community people. The target group for this research was community elders, herbalist or traditional doctors, farmers both men and women and traders.

#### Data analysis

Data collected was analyzed using simple statistical methods and illustrations by use of table, percentage and mean. The raw scores were transformed into descriptive statistics by using simple statistical calculations.

#### Results

About 56% of the respondents interviewed age ranges from 29-46 years while 72% of the total respondents interviewed were married. Farmers, traders and civil servant form 95% of the target group. Within the target group, 78% had attained education in one form or the other (Table 2). About 66% of the respondents perceived to use Neem tree to cure sicknesses ranging from malaria, fever, wounds, ringworm, dysentery, vomiting, scabies, toothache, Impotency, high-blood pressure, upset, smallpox, snakebite, pile and constipation. The leaves of Neem were the major parts used as traditional medicine by 74% of the respondents. About 78% of the respondents admit of using Neem products on a daily basis (Table 5). The major livelihood function of the Neem tree was health 40% and energy 32% respectively (Table 6)

Table 2: Demographic characteristics of respondent

Age range of respondents	Villages									
	Mosongo		Mokonde		Bonganema		Foyah		Total	
	No	%	No	%	No	%	No	%	No	%
20 - 28	7	35	1	8.3	1	10	-	-	9	18
29 - 37	6	30	4	33.3	2	20	-	-	12	24
36 - 46	3	15	5	41.7	3	30	5	62.5	16	32
47 - 55	2	10	1	8.3	3	30	1	12.5	7	14
56 - 64	1	5	-	-	-	-	2	25	3	6
65 - 73	1	5	1	8.3	1	10	-	-	3	6
<b>Total</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>
<b>Sex of respondent</b>										

Male	10	50	7	58.3	5	50	4	50	26	52
Female	10	50	5	41.7	5	50	4	50	24	48
<b>Total</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>
<b>Marital status</b>										
Married couple	15	75	8	66.7	6	60	7	87.5	36	72
Single	4	20	4	33.3	3	30	-	-	11	22
Widow	1	5	-	-	1	10	1	12.5	3	6
<b>Total</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>
<b>Educational status</b>										
Primary	2	10	3	25	1	10	-	-	6	12
Secondary	6	30	3	25	4	40	4	50	17	34
Tertiary	7	35	5	41.7	3	30	1	12.5	16	32
Vocational	3	15	-	-	-	-	2	25	5	10
Non formal	2	10	1	8.3	2	20	1	12.5	6	12
<b>Total</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>
<b>Occupation of resp</b>										
Farmers	4	20	2	16.7	4	40	3	37.5	13	26
Trader	8	40	3	25	4	40	3	37.5	18	36
Civil Servants	8	40	6	50	1	10	1	12.5	16	32
Herbalist	-	-	1	8.3	1	10	1	12.5	3	6
<b>Total</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>

Table 3: Perceived sickness cured by neem plant usage

Perceived sicknesses cured by neem uses	Villages									
	Mosongo		Mokonde		Bonganema		Foya		Total	
	No	%	No	%	No	%	No	%	No	%
Snake bite, constipation	3	15	-	-	1	10	1	12.5	5	10
Malaria and Fever	13	65	7	58.3	7	70	6	75	33	66
Dysentery and Vomiting	2	10	2	16.7	1	10	-	-	5	10
Toothache	-	-	1	8.3	-	-	-	-	1	2
Upset, high blood pressure	1	5	-	-	-	-	-	-	1	2
Impotency	-	-	1	8.3	-	-	-	-	1	2
Ring worm, wounds	-	-	-	-	1	10	-	-	1	2
Scabies and Smallpox	1	5	1	8.3	-	-	1	12.5	3	6
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>

Table 4: Parts of the Neem tree used for medicinal purposes

Partsof neem plant used as medicine	Villages									
	Mosongo		Mokonde		Bonganema		Foyah		Total	
	No	%	No	%	No	%	No	%	No	%
Leaves	16	80	7	58.3	7	70	7	87.5	37	74
Stem / Twigs	-	-	1	8.3	-	-	-	-	1	2
Roots	2	10	-	-	1	10	-	-	3	6
Bark	-	-	-	-	-	-	1	12.5	1	2
Seed	-	-	1	8.3	-	-	-	-	1	2
Leaves, Root and Bark	2	10	-	-	-	-	-	-	2	4
Leaves and Root	-	-	-	2.5	-	-	-	-	5	10
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>

Table 5: Frequency of use

Neem use frequency	Villages									
	Mosongo		Mokonde		Bonganema		Foyah		Total	
	No	%	No	%	No	%	No	%	No	%
Daily	14	70	9	75	9	90	7	87.5	39	78
Weekly	2	10	-	-	-	-	1	12.5	3	6
Monthly	-	-	-	-	1	10	-	-	1	2
Yearly	4	30	3	25	-	-	-	-	7	14
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>

Table 6: Livelihood function of Neem tree within Kori Chiefdom.

Livelihood function of neem tree	Villages									
	Mosongo		Mokonde		Bonganema		Foyah		Total	
	No	%	No	%	No	%	No	%	No	%
Health (herbs)	10	50	4	33.3	3	30	3	37.5	20	40
Cultural/spiritual	4	20	1	8.33	1	10	-	-	6	12
Income (Sale of Products)	1	5	1	8.33	1	10	2	25	5	10
Social (Instrument)	1	5	1	8.33	-	-	1	12.5	3	6
Energy (Fuel wood)	4	20	5	41.7	5	50	2	25	16	32
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>

Table 7: Miscellaneous uses of Neem plant

Other uses of the neem tree	Villages									
	Mosongo		Mokonde		Bonganema		Foyah		Total	
	No	%	No	%	No	%	No	%	No	%

Afforestation	16	80	5	41.7	7	70	6	75	34	68
Firewood and charcoal	4	20	1	9.3	1	10	1	12.5	7	14
Beautification	-	-	3	25	2	20	1	12.5	6	12
Shade provision	-	-	3	25	-	-	-	-	3	6
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>12</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>50</b>	<b>100</b>

### Discussion

The findings revealed that majority of the respondent's age ranges from 29 to 46 years and were mostly married. This age group bracket was found to be using Neem plant for various illnesses. The results, further shows that majority of the respondents 52% that were using the Neem plant as medicine were men while about 48% of them were female. In most part of Kori Chiefdom, people believe in taking native herbs such as Gbangba, Moringa, Neem and Pineapple barks to cure various sicknesses because medical facilities are inadequate. Malaria, fever, snakebite, vomiting, dysentery and smallpox were the major sicknesses cured using the Neem plants. In terms of local herbs used in the study area, Neem medicinal properties give it edge over other local herbs that are used to solely cure one type of illness. In third world countries, Neem has been used for centuries to provide health cover to human and livestock in various forms. In poultry, the bark is used to treat wounds, diarrhoea, ticks and lice (Ogbuewu, 2009). About 24% of the respondents had secondary education while 32% had tertiary education as shown in (Table 2). Even though Njala University is situated in Kori Chiefdom, educational standards are low for local residents due to factors such as laziness, educational endurance and available labor jobs. Despite the facts that some members within these communities are educated, there is still low level of

awareness about the medicinal importance of Neem trees, because the educated care less about herbs and while those who know its importance's are not educated. Findings further shows that 36% of the respondents were traders but not trading in Neem trees/plant parts in any way. They were engage in other petty trading activities such as rice selling, alcohol, palm oil and seasonal foods, while 32% were civil servants. The presence of Njala University within the study area serves as a source of civil employments for the locals though majorities are junior staff. The study further shows that 100% of the respondent had knowledge about the medicinal usefulness of the Neem plant but not all of them have used it before. In Sierra Leone, medicinal herbs are mostly used by the less privilege but ignored by most so called middle or rich class. Apart from the medicinal value of the Neem plant, it can also be used as firewood, poles, and charcoal, for shade, land demarcation, insect repellants and paper (Pamaret *al.*, 1996). Jaimandet, *a.,l* (2002) found out that a cultivated Neem plants supply humanity with a vast range of medicine and other raw materials and it also help combat desertification. Besides the medicinal importance of Neem plant in the study area, house owner plant it in the Centre of compounds for shade (Person communication.com).

About 66% of the respondents were using the Neem plant as medicine to cure malaria and fever (Table 3). Malaria and

fever are the most endemic diseases in the study area and Sierra Leone as a whole (PROTA, 2010). Dawar et al., (1999) observed that mosquitoes expose to volatiles of crushed Neem seeds as well as oil can prevent mosquitoes from laying eggs and a further 90 minutes exposure to ordure from broken Neem seeds can again suppresses egg laying by mosquitoes. About 10% of the respondents were using the Neem plant to cure snake bite constipation, dysentery, and vomiting respectively. Chaturvedi et al. (1995) found out that Neem tree brings joy and freedom from various diseases. It has proven beneficial for the following: skin diseases, itching, leprosy, blood disorder, worms, diabetes, piles, constipation, dysentery, jaundice, vomiting, wounds, eye diseases, paraplegia, female genital diseases, ulcers, scabies, ring worms, eczema, boils and all type of fever. However, most respondents refused to point out the use of the Neem plant for the above illness for fear of exposing them but one could observe the possibility. About 78% of the respondent's were using the Neem plant on daily basis. Since rural areas are prone to disease and proper medical facilities are lacking and inadequate, majority of the respondent admitted of using the plant as medicine in a daily basis. Other reason might be the cost of drugs in pharmacies. As the saying goes prevention is better and even cheaper than cure. Biswas *et, al* (2002) opined that all parts of the Neem such as seeds, flowers, leaves, bark, twigs, and roots are all use in preparing medicine for various sicknesses. All parts of the plant, as well as the gum and oil, are effective against worms, wounds in the mouth, glossitis, *E. coli*, *bacillosis*, swelling of the liver, jaundice, bloody dysentery and intestinal

wounds (Ketkar and Ketkar, 1995). Others functions of the Neem tree in the study area were beautification, shade provision, afforestation and energy. The branching habit of Neem also gives the plant advantage over other species in compounds and plantation. The Neem plant has proven beyond all doubts that it is indeed a medicinal plant and can cure most of the common illnesses in our communities especially the rural settings.

### Conclusion

In summary, the Neem plant is gaining momentum among the locals within Kori Chiefdom as the plant that cures almost all sickness. The following sicknesses were found to be cure by the Neem plants: malaria, fever, wound, ringworm, dysentery, vomiting, scabies, toothache, Impotency, high-blood pressure, upset, smallpox, snakebite, pile and constipation. It was concluded that though many people have not used the Neem as medicine to cure any sickness, however, its medicinal function is no secret within the Chiefdom. The finding conclude that every parts of the Neem such as seed, flowers, leaves, bark, roots, twigs and gum were used for medicinal purposes. Almost two-third of respondents interviewed admitted that they have used the Neem tree for medicinal purposes. Other function such as beautification, energy and shade in compounds etc., are less known function for the species. It is recommended therefore that, communities be given incentives to grow Neem trees in their communities as well as their barrel lands. This finding will serve as a bench mark for detail research in this direction in the near future.

### Recommendations

1. Sensitization and awareness raising pertaining to the Neem plant establishment

should be carried out at the length and breadth of the country in general and Kori Chiefdom in particular, so that the people will accept the idea of planting the Neem plant at community level

2. Neem nursery centers should be established in the communities to enhance and ease the accessibility of seedlings to the communities

3. Rural people should be encouraged to adopt agro-forestry system to facilitate their food security drive alongside Neem planting activities

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## Traditional healing practices of tribal healers

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### Abstract

Kanchanpur subdivision of North Tripura is known for the tribal population with a diversity of Tripuri, Reang, Jamatia, Noatia, Chakma, Lusai, Halam, Mog community. Extensive appraisal was conducted in the rich areas of Kanchanpur to collect the Traditional Knowledge and Ethno-medicinal plants used by the tribal people of the state. Because of modernization, all the ethno-botanical knowledge is declining day by day, so there is an urgent need to document the knowledge of ethnic people. Here more than 100 plant species belong to 100 genus of ethno-medicinal values were recorded from, Kanchanpur subdivision of North Tripura, India. Medicinal plants play an important role in traditional health care system in cultural identity and livelihood security. Hence, there is a necessity for *insitu* and *exsitu* conservation of these medicinal plants for future use. Conservation of RET species has been a global concern as the whole world is realizing that the biodiversity is being degraded very fast. Ex-situ conservation of medicinal plants in the herbal home gardens raised by traditional healers helps them earn their livelihood by serving the poor patients besides enriching their traditional knowledge base. It is also a way of conserving Rare, Endangered and Threatened (RET) species of Medicinal Plants.

**Key words:** Medicinal plants, Traditional Healers, Ethno botany, *Ex-situ* conservation, Traditional knowledge, Livelihood.

### Introduction

Tribal communities are considered to be forest dwellers living in harmony with their environment. They depend heavily on plants and plant products for making food, forage, fire, beverages, edible and non-edible oils, construction of dwellings, making household implements etc in every and each step of their life the forest dwellers mainly depend upon on the forests. A close association with nature has enabled tribal people to observe the rich flora and fauna around them for developing their own traditional knowledge, and over the years they have developed a great deal of knowledge on the use of plants and plant products as herbal remedies for various ailments ranging from simple injuries, wounds, stomach pain, fever, cold and cough, bleeding and wounds, fungal infection, burns, rheumatic pain, insect bite, influenza, diarrhoea, jaundice and cirrhosis, ulcers, swelling, bone fractures, potency, antidote, skin care, night blindness, toothache, asthma and many more, time have described the medicinal importance of plants to the healers. India is well known as an "Emporium of medicinal plants". About 70% of the rural folk depend on medicinal plants for their health care. (Billore, K. V., T. G. Joseph and S. K.



Dave) Ayurveda is a medical system primarily practiced in India that has been known for nearly 5000 years it has been used and practice in India with its medicinal value to diagnosis different disease this system includes herbal plants to made traditional diagnosis. (Hemadri, K. Rheumatism) Ayurveda is gaining prominence as the natural system of health care all over the world. Later on, there have been a number of workers from time to time who have described the medicinal importance of plants, namely Charak, Watts, Kirtikar and Basu, Chopra, Nadkarni, etc. (Lalramnghinglova, H.)

#### **Study area**

Vaidyaraj Herbal Grower's Society operates in Kanchanpur, The Traditional Healers (Kaviraj) at Netaji Nagar and Dupatacherra area of Kanchanpur have established herbal gardens (400 – 2000 sq m) on their homesteads and about 500 species of medicinal herbs have been planted and well maintained in the gardens. A participatory plan to study their performance under domestication and thereby livelihood development and promotion of medicinal plants is being carried out. The practitioners of Vaidyaraj Herbal Growers Society (VHGS) have created ten such herbal gardens across Kanchanpur sub-division in North Tripura district. The members of the society, who belong to different tribes like Tripuri, Reang, Jamatia, Noatia, Chakma, gather regularly in the garden to nurture the herbal medicinal plants and share their traditional knowledge. The group is also compiling and documenting their ancestral knowledge on Ayurveda in the form of a book to pass it on to the future generations. The garden is one among the many herbal gardens started in the area of two hectares by some 55 traditional

practitioners. The goal is to promote traditional medicines and preserve traditional knowledge as well as provide forest-based livelihood generation to growers and practitioners.

#### **Healing practices by traditional healers**

Ethno-botanical survey was conducted by repeated interviews and conversations with aged ethnic people, local herbal healers, shepherds, tribal headmen of the area. In different seasons for the years several field trips were conducted between the years 2014 to 2017 in the district to record the ethno-botanical knowledge of the local healers of Kanchanpur area. The data were collected through questionnaires, discussions among the tribal people. The traditional medical practitioners treat all the age groups with suffering general problems, by prescribing traditional medicines that are readily available and affordable. Their treatment is comprehensive and has curative, protective and preventive elements by natural or ritual, or both, depending on the cause of the disease. According to one of the healers, tribal patients are mainly depend upon them and getting benefit from this practice. The food habits and simple daily requirements also help them to cure and get relief from many diseases. The information on useful plant species, local names, family, vernacular names, habitat, parts used and that includes medicinal or any other purpose, mode of utilization was collected. The information collected was further verified by different traditional healers. Plants used in their daily needs were also collected. Plants used in their traditional medicinal uses were identified with the help of regional flora. The sorted information on ethno-botanical knowledge of important plants adapted in traditional practice of treatment is given in Table 1.

TABLE.1. Ethno-medicinal plants used by the Traditional Healers of Kanchanpur area

S. No.	Common diseases	Name of plants used		Parts used		Formulation process by the Traditional Healers
		Local name	Scientific name	Family		
1	Stomach disorder	Ginger	<i>Zingiberofficinale</i>	Zingiberaceae	Rhizome	Process of preparation by the local practitioners <i>ginger, golmorich, loun, sudadha, hetranga</i> are mixed together to make powder, after that the powder is mixed with honey to make a paste, after that it is dried for making tablets. It is given for 20-30 days to cure gastric. It is also used for constipation and fever.
		Golmorich	<i>Piper nigrum</i>	Piperaceae	Fruits	
		Loung/Cloves	<i>Syzygiumaromaticum</i>	Myrtaceae	Flower bud	
		Hetranga	<i>Hydrangea macrophylla</i>	Hydrangeaceae	Roots	
		Amla	<i>Phyllanthusemblica</i>	Phyllanthaceae	Fruits	
		Hartaki	<i>Terminalia chebula</i>	Combretaceae	Fruits	
		Bahera	<i>Terminalia bellirica</i>	Combretaceae	Fruits	
		Pipul	<i>Ficusreligiosa</i>	Moraceae	Fruits	
		Boroi	<i>Ziziphusmauritiana</i>	Rhamnaceae	Seed	
		Mango	<i>Mangifera indica</i>	Anacardiaceae	Seed	
2	Diabetes	Surchang / Thyme	<i>Thymus vulgaris</i>	Lamiaceae	Roots and leaf	Process of preparation by the local people <i>surchang</i> is applied as tablet by triturating. <i>hiumbetya</i> is applied by cooking. <i>telakuchi</i> is mixed with dry fish and salt through cooking, and then it is taken with rice, while disease arises.
		Hiumbetya/Comfrey	<i>Symphytumofficinale</i>	Boraginaceae	Leaf	
		Telakuchi	<i>Cocciniagrandsis</i>	Cucurbits	Leaf	

3	<b>Jaundice</b>	Chirata	<i>Swertiaperennis</i>	Gentianaceae	Leaf	Process of preparation by local practitioners all the ingredients are mixed up to make a juice and then given to the patient for drinking as medicine.
		Arhar	<i>Cajanuscajan</i>	Legumes	Leaf	
		Amla	<i>Phyllanthusemblica</i>	Phyllanthaceae	Fruit	
		Bahera	<i>Terminalia bellirica</i>	Combretaceae	Fruit	
		Balsakow	<i>Viburnum prunifolium</i>	Adoxaceae	Root	
		Gandhari	<i>Fagoniacretica</i>	Zygophyllaceae	Root	
		Jongolerkejpata	<i>Neolamarckiacadamba</i>	Rubiaceae	Root	
		Bakormo	<i>Brugmansiasuaveolens</i>	Solanaceae	Root	
		Hartaki	<i>Terminalia chebula</i>	Combretaceae	Fruit	
		Arjun	<i>Terminalia arjuna</i>	Combretaceae	Tuber	
		Alkoshi	<i>Mucunapruriens</i>	Fabaceae	Bark	
		Ashwagandha	<i>Withaniasomnifera</i>	Solanaceae	Fruit	
		Guruchi	<i>Tinosporacordifolia</i>	Menispermaceae	Root	
Gukhur	<i>Tribulusterrestris</i>	Zygophyllaceae	Stem			
5	<b>Bone fracture</b>	Harjora	<i>Cissusquadrangularis</i>	Vitaceae	Whole plant	Process of preparation by local practitioners all the ingredients are mixed up to make a juice and then given to the patient for drinking as medicine twice a week.
		Ginger	<i>Zingiberofficinale</i>	Zingiberaceae	Rhizome	
		Bati	<i>Cissusquadrangularis</i>	Vitaceae	Leaf	
		Neem	<i>Azadirachtaindica</i>	Meliaceae	Leaf	
		Basaka	<i>Adhatodavasica</i>	Acanthaceae	Leaf	

6	<b>Gynecological disorder</b>	Golmorich	<i>Piper nigrum</i>	Piperaceae	Fruits	Process of preparation by the local practitioners <i>golmorich, sudadha, loung, hetranga</i> are mixed together to make powder and mixed with honey to make paste, from which tablet is made. The bark parts of <i>Sorbatch</i> plants are paste to make juice. This juice is taken 2 times per day with tablet for 30 days; it is used for gynecological problem.
		Loung/Cloves	<i>Syzygium aromaticum</i>	Myrtaceae	Flower bud	
		Hetranga	<i>Hydrangea macrophylla</i>	Hydrangeaceae	Roots	
7	<b>General weakness</b>	Bashak	<i>Adhatodavasic</i>	Acanthaceae	Leaf	Process of preparation: The parts of plants are mixed together by triturating/grinding to make a paste.
		Tulsi	<i>Ocimum tenuiflorum</i>	Acanthaceae	Leaf	
		Kalmegh	<i>Andrographis paniculata</i>	Acanthaceae	Leaf	
		Kobabchini	<i>Piper cubeba</i>	Piperaceae	Fruits	
		Ginger	<i>Zingiber officinale</i>	Zingiberaceae	Rhizome	
8	<b>Paralysis</b>	Kolathur, chainohula	<i>Musa spp</i>	Musaceae	Whole plant	Process of preparation: The parts of the plants mixed by triturating and make a juice and give it to the patient. Another treatment is there, leafs are heated by boiling and in this water make a bath. Note- 3 times a day uses. The ingredients are mixed together with the
		Dhenuaatpho	<i>Cannabis sativa</i>	Cannabaceae	Hemp	
		Elaichi	<i>Elettaria cardamomum</i>	Zingiberaceae	Fruit	
		Pora, Panipuri	<i>Tephrosia hookeriana</i>	Fabaceae	Whole plant	
		Thankuni	<i>Centella asiatica</i>	Umbellifers	Leaf	
		Jaba	<i>Hibiscus rosa-sinensis</i>	Malvaceae	Leaf	

						help of trituration to make a juice which is then provided to the patient for drinking. In addition the patient is advised to take bath with water prepared by boiling the leaves all together. Patient is advised to take the juice 3 times a day.
9	<b>Skin disease</b>	Neem	<i>Azadirachtaindica</i>	Meliaceae	Leaf	Process of preparation: The parts of plants are mixed together by triturating/grinding to make a paste and then applied to the patients affected skin. Note- Minimum recovery time is 20 days
		Aakon	<i>Augusteferrier</i>	Cannaceae	Extract	
		Turmeric	<i>Curcuma longa</i>	Zingiberaceae	Whole	
		Cassia	<i>Cassia fistula</i>	Fabaceae	Leaf	
10	<b>Eczema</b>	Aakon	<i>Augusteferrier</i>	Cannaceae	Extract	Process of preparation: The parts of plants are mixed together by triturating/grinding to make a paste and then applied to the patients. Minimum recovery time after 20-25 days
		Cusmilka	<i>Brassica napus</i>	Brassicaceae	Extract	
		Neem	<i>Azadirachtaindica</i>	Meliaceae	Leaf	
		Turmeric	<i>Curcuma longa</i>	Zingiberaceae	Whole	
11	<b>Fistula and</b>	Lotichoria	<i>Arum spp.</i>	Araceae	Rhizome	Process of preparation: The

	<b>piles</b>	Muli Bamboo	<i>Melocannabaccifera</i>	Poaceae	Choung/	parts of plants are mixed together by triturating/grinding to make a paste and then applied to the patients twice a day
		Tulsi(black)	<i>Ocimumtenuiflorum</i>	Lamiaceae	Leaf	
		Chalmugra	<i>Hydrocarpuswightiana</i>	Achariaceae	Fruit	
		Jam	<i>Sizygiumcuminii</i>	Myrtaceae	Leaf	
		Genda	<i>Tagetespatula</i>	Asteraceae	Leaf	
		Durba	<i>Cynotondaetylon</i>	Poaceae	Whole plant	
		Jungle Hartaki	<i>Terminalia chebula</i>	Combretaceae	Fruit	
12	<b>Worm infestation</b>	Bati	<i>Cissusquadrangularis</i>	Vitaceae	Leaf	Process of preparation: The parts of plants are mixed together by triturating/grinding to make a dust powder, and given to the patient. Note- 2 times a day.
		Neem	<i>Azadirachtaindica</i>	Meliaceae	Leaf	
		Basaka	<i>Adhatodavasica</i>	Acanthaceae	Leaf	
		Shepalika	<i>Nyctanthes arbor</i>	Oleaceae	Leaf	
		Chirata	<i>Swertiachirayaita</i>	Gentianaceae	Leaf	
		Ginger	<i>Zingiberofficinale</i>	Zingiberaceae	Rhizome	
		Manjistha	<i>Rubiaccordifolia</i>	Rubiaceae	Root	

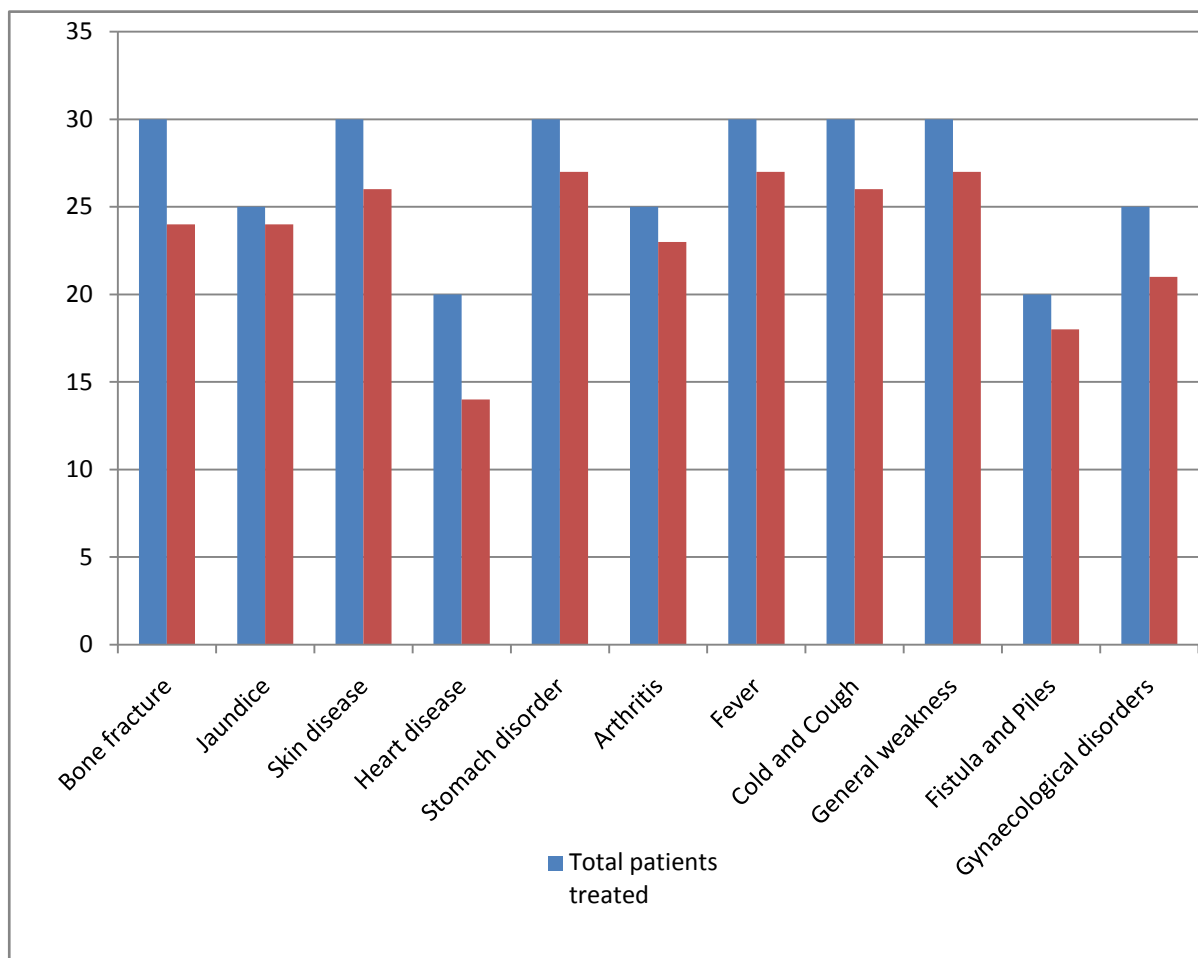
### Result and discussion

Ayurveda, which literally means the science of life, is an ancient Indian system of natural and holistic medicine. Creating a self-help healers group with 55 traditional healers from different tribes to collect, grow and market over 100 varieties of rare and endangered medicinal plants by their valuable research in preparing traditional medicines and it has been found they are being used for different chronic and fatal disease. These farms have helped ensure availability of the requisite plants and conserve biodiversity and several rare species. Once it has been lost in the fame and development of allopathy and medical science, Ayurveda is gradually reviving again and getting popular since it has negligible side effects and is a totally natural form of treatment. The members of the society, with some financial and technical help from the Centre for Forest-based Livelihoods and Extension, have

collected hundreds of rare species of herbs useful in preparing Ayurvedic medicines from far flung areas and are growing them in these gardens. The idea behind the herbal garden besides preservation is to get access to various herbs at one spot as and when necessary or required. To meet their requirements from these herbal gardens the traditional healers are working in an area of approx 2 ha in total and grown over 100 varieties of rare and endangered medicinal plants and supplying their parts in market also besides using in the traditional formulations. All efforts under the activity have been using traditional knowledge, practices and innovations and are being maintained accordingly by the *kaviraj's* themselves. Besides these, observations on ex-situ conservation aspects of important medicinal plants are also being documented on promotion of traditional healing practices under 'Vaidyaraj Herbal Growers'.

Table 2.1 Response of traditional healing practices

Name of diseases	Total patients treated	Positive feedbacks	% of positive response
Bone fracture	30	24	80%
Jaundice	25	24	96%
Skin disease	30	26	86%
Heart disease	20	14	70%
Stomach disorder	30	27	90%
Arthritis	25	23	92%
Fever	30	27	90%
Cold and Cough	30	26	86%
General weakness	30	27	90%
Fistula and Piles	20	18	90%
Gynaecological disorders	25	21	84%



**Fig. 1 :** Traditional healing practices

### Conclusion

Herbs can serve as a major way of treating certain conditions or diseases in many way if the herb can be grown locally or regionally, the basic source in the study aimed at conservation, cultivation, improvement of ethnic traditional medicine and economic welfare of rural and tribal population of the region. The traditional healing knowledge will provide secure livelihood to the native tribes that minimize the resource depletion, environmental degradation, cultural disruption and social instability. This kind of activity also enriches the participatory mechanism which ensures the conservation of endangered, threatened and rare species of herbal plants in sustainable manner. Besides helping in conserving the local bio-diversity, this will

also go a long way in generating employment. Such research may help to gather information to the pharmacologists in screening of individual species and in rapid assessment for the treatment of various diseases.

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## Horse Gram: A multipurpose crop

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Horse Gram, *Macrotyloma uniflorum* (Lam.) Verdc., is a hardy pulse crop of semi-arid tropics. It is wide spread pulse in India and late sowing in rainy season by poor farmer in tribal localities and drought prone areas of India. Despite its current and historical importance to the diet of a large part of the population in India, there are entrenched biases against horsegram, as it is considered a low status food of the poor, particularly in southern India. In traditional ayurvedic cuisine, horse gram is considered a food with medicinal qualities. In Indian traditional medicine, seeds of horse gram are used for treatment of urinary stones (Ravishankar and Vishnupriya, 2012), urinary diseases and piles (Yadava and Vyas, 1994), regulate the abnormal menstrual cycle in women (Neelam, 2007), act as astringent, tonic (Brink, 2006), and also used to treat calculus afflictions, corpulence, hiccups, and worms (Chunekar and Pandey, 1998) and It is prescribed for persons suffering from jaundice or water retention and as part of a weight loss diet. It is grown especially in dry lands. Being predominately a self pollinated crop. Horse gram can also be used for preparation of many dices like kollu soup, dal, drinking juice, and boiled horse gram. In horse gram is an important crop of south India. Its grain is used for human consumption as 'dal' as well as in preparation of 'rasam' and also as a concentrated feed for cattle. It may also be

used as green manure. This crop is generally grown when the cultivator is unable to sow any other crop for want of timely rains and also grown in vacant space of orchard. Crop Status Horse gram is mainly cultivated in the states of Karnataka, Andhra Pradesh, Orissa, Tamil Nadu, M.P., Chhattisgarh, Bihar, W.B., Jharkhand, and in foot hills of Uttaranchal and H.P., in India. It is also cultivated in other countries mainly Sri Lanka, Malaysia, West Indies etc. During Twelfth Plan (2012-2015) in India, the total area under Horsegram and its production during this plan was 2.32 lakh hectares and 1.05 lakh tonnes respectively. In terms of area and production, Karnataka is on the first position on all India basis contributing 26.72% and 25.71% respectively followed by Odisha (19.46% & 15.48%) and Chhattisgarh (19.29% & 13.29%). The highest yield was recorded in the state of Bihar (959 kg/ha) followed by W.B. (796 kg/ha) and Jharkhand (603 kg/ha) (DES, 2015-16).



Fig. 1: Field view of horse gram

Table 1: Nutritional value of horse gram per 100 grams

Sr No	Nutrients	Amounts
1	Energy	321 Ecals
2	Moisture	12 g
3	Protein	22 g
4	Fat	0 g
5	Mineral	3 g
6	Fiber	5 g
7	Carbohydrates	57 g
8	Calcium	287 mg
9	Phosphorous	311 mg
10	Iron	7 mg

### Some bad effects of eating horse gram

Though horse gram always brings great nutrition value and health benefits to a healthy person yet there is an exception. It is not considered good for the people suffering from hyperacidity and gastric ulcers.

Apart from that, it is not good for the bleeding disorders. Therefore, people who suffer nasal bleeding and have heavy period must avoid it. Horse gram is also not recommended for the men who are undergoing infertility treatment, pregnant women, recovering from tuberculosis and willing to gain weight.

### State-wise recommended varieties

Rajasthan- KS-2, Pratap Kulthi (AK-42)  
A.P. Palem-1, Palem-2, Paiyur-2, PHG-9  
Tamil Nadu- Paiyur-2 Karnataka PHG-9,  
GPM-6, CRIDA-1-18 R Gujarat- Pratap  
Kulthi-1 (AK-42), GHG-5 Uttarakhand  
VL- Gahat-8, VL Gahat-10 Chhattisgarh-  
Indira Kulthi-1, IKGH01-01 and

Jharkhand-Birsa Kulthi-1, Madhu, VLG-15 etc.

### Yield potential

(FLD Result) It is observed that in general average potential yield gap between FLD and farmer's local check yield is about 45 %. The potential yield level could be obtained by adoption of improved package of practices.

### Climate requirement

Horsegram is extremely drought-resistant crop. Moderately warm, dry climatic conditions are suitable for its optimum growth. It does not grow well on higher altitudes because of cool and wet climate. Horsegram can be cultivated up to an altitude of 1000 m above the sea level. The temperature range of 25-30°C and relative humidity between 50 and 80% is optimum for its growth. Heavy rains during the initial stages of crop growth affect nodule formation owing to poor aeration in the soil. A well-distributed rainfall of about 600 mm is sufficient for its successful cultivation, but it performs well even

under low rainfall areas and it can be also used late kharif as contingent crop in case main kharif crop failure condition. It helps increase cropping intensity, nutritional as well as improving soil health.

#### Soil type and field preparation

Generally grow on poor in fertility soil. The crop can be grown on wide range of soils from light to heavy soils which are friable with good water holding capacity and good drainage. The crop needs minimum field preparations. Only 1-2 ploughings followed by planking provides desirable seed-bed. Best result can be achieved sowing with seed drill machine for maintaining spacing and placing of seed in standard depth.

#### Sowing time

The main season for sowing horse gram is late August-November. As a fodder crop it is sown during June-August. In Tamil Nadu, it is sown in September-November. In Maharashtra, horse gram is sown as a kharif crop, mixed with bajra or sometimes Niger and also in the Rabi in rice fallows. In M.P. it is a Rabi crop. In northern parts it is grown as kharif crop. In West Bengal the sowing period is October-November. In Jharkhand the sowing period is August-September so it helps in planning as contingent crop.

#### Seed rate and spacing

Generally sown as broadcast with 40 kg/ha seed rate for dual purpose i.e. grain and fodder. For line sowing 25-30 kg/ha is enough for grain crop. Row Spacing: 40-45 cm during kharif and 25-30 cm during

#### Plant protection measures

rabi and about 10 cm plant to plant spacing.

#### Seed treatment

Seeds must be treated with seed treating fungicide to reduce infection by fungal pathogens found in the soil. Horse gram seeds are treated with carbendazim @ 2g/Kg of seeds. Now-a-days bio fungicide like *Trichoderma viridi* is recommended for pulses @ 4g/ per kg seed. After fungicide treatment seed should be inoculate with Rhizobium and PSB culture @ 5-7 g/kg of seed.

#### Fertilizer management

20-25 kg nitrogen and 30 kg P<sub>2</sub>O<sub>5</sub> per ha as basal application at the time of sowing 2-5 cm below and in the side of the seed with the help of ferti.-seed drill is enough for good management of crop. For better result need at least 3-5 tons compost incorporated with soil 15 days before sowing.

#### Water management

Irrigation should be apply at before flowering and pod formation stage if monsoon rain not received during these stages for the harvest of potential yield, although this crop is suppose to rainfed crop.

#### Weed management

Due to luxuriant growth an early weeding/hoeing is enough for weed control. Application of Pendimethalin @ 0.75-1 kg a.i./ha as pre emergence application. After that, one hand weeding was done at 25-30 days after sowing.

Table 2: Insect Pest/Disease/ Causal Organism Nature of Damage/ Symptoms Control Measures

Insect Pest/Disease/ Causal	Nature of Damage/ Symptoms	Control Measures

Organism		
i. Aphids	The adults and nymphs suck the juice from the leaves as a result turn brown and crumpled and the plants look sick	Spray of Oxydemeton methyl 25 @ 1 ml/liter or Dimethoate 30 EC @ 1.7 ml/liter water
ii. Jassids	The adults and nymphs suck the juice from the leaves as a result leaves turn brown and leaf surface become uneven. In severe infection leaves dry up and fall and weaken the plants.	
iii. Pod borer	It is a polyphagous insect. Caterpillar makes hole in pods, sometime also feed seed.	Spray trizophose @ 2ml/liter water or Quinolphos 25 EC @ 2 ml/liter water
iv. Yellow Mosaic Virus vector-white fly	The symptoms firstly appear on young leaves in the form of yellow, diffused, round spots scattered on the leaf lamina. The infected leaves turn necrotic. The diseased plants usually mature later and bear relatively few flowers and pods. The pods are stunted and mostly remained immature but whenever seeds are formed they are small in size.	i. Grow resistant varieties. ii. Destroy the infected plants. iii. Spray of Oxydemeton methyl 25 @ 2 ml/liter or Dimethoate 30 EC @ 1.7 ml/liter water and repeat after 15 days, if necessary
v. Root rot	Roots rot and plants show yellowing of the lower-most leaves followed by wilting.	i. Seed treatment with 2g Captan or Carbendazim/ 2 kg of seed. ii. Avoid early sowing in infested areas

### Harvesting and threshing

As usual with other kharif pulses, clean seed should be sun dried for 3-4 days to bring their moisture content at 9-10% to be safely stored in appropriate bins.

### Storage

To avoid further development of bruchids and other storage pests it is recommended to fumigate the storage material before onset of monsoon and again after the monsoon with ALP @ 1-2 tablets per tonne. The small quantity of the produce can also be protected by mixing inert material (soft stone, lime, ash, etc) or by smearing edible/non-edible vegetable oils or by mixing plant products like neem leaf powder at the rate of 1-2% weight by weight basis.

### Yield

By adopting improved package of practices can be harvest 12-15 q/ha depending upon the soil condition and monsoon behaviour.

### Recommendation to achieved higher production

1. Deep summer ploughing once in 3 years.
2. Seed treatment should be done before sowing.
3. Application of fertilizer should be based on soil test value.
4. Weed control should be done at right time.
5. Adopt integrated approach for plant protection.
6. Proper spacing should be maintained.

## Mashrooms and their importance

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### Abstract

Mushroom is a plant constructed with no tissue structures. Which can be a unicellular or multicellular organism? Although mushroom is a type of plant, they do not contain cellulose and chlorophyll. So that they cannot create their own nutrients, they must have to living on another plants or animals to absorb nutrition from them. In the present article the importance of mushrooms with references to habitat, identifications characters, and nutritional value with common and poisonous mushroom characters, their identifications and other importance of mushrooms has been discussed.

### Introduction

The standard for the name "mushroom" is the cultivated white button mushroom, *Agaricus bisporus*; hence the word "mushroom" is most often applied to those fungi (Basidiomycota, Agaricomycetes) that have a stem (stipe), a cap (pileus), and gills (lamellae, sing. lamella) on the underside of the cap. "Mushroom" also describes a variety of other gilled fungi, with or without stems, therefore the term is used to describe the fleshy fruiting bodies of some Ascomycota. These gills produce microscopic spores that help the fungus

spread across the ground or its occupant surface.

Forms deviating from the standard morphology usually have more specific names, such as "bolete", "puffball", "stinkhorn", and "morel", and gilled mushrooms themselves are often called "agarics" in reference to their similarity to *Agaricus* or their order Agaricales. By extension, the term "mushroom" can also designate the entire fungus when in culture; the thallus (called a mycelium) of species forming the fruiting bodies called mushrooms; or the species itself.

### Identification

#### Morphological characteristics of the caps of mushrooms

Identifying mushrooms requires a basic understanding of their macroscopic structure. Most are Basidiomycetes and gilled. Their spores, called basidiospores, are produced on the gills and fall in a fine rain of powder from under the caps as a result. At the microscopic level the basidiospores are shot off basidia and then fall between the gills in the dead air space. As a result, for most mushrooms, if the cap is cut off and placed gill-side-down overnight, a powdery impression reflecting the shape of the gills (or pores, or spines, etc.) is formed (when the fruit body is

sporulating). The color of the powdery print, called a spore print, is used to help classify mushrooms and can help to identify them. Spore print colors include white (most common), brown, black, purple-brown, pink, yellow, and creamy, but almost never blue, green, or red (Dickinson C, Lucas J, 1982).

While modern identification of mushrooms is quickly becoming molecular, the standard methods for identification are still used by most and have developed into a fine art harking back to medieval times and the Victorian era, combined with microscopic examination. The presence of juices upon breaking, bruising reactions, odors, tastes, shades of color, habitat, habit, and season are all considered by both amateur and professional mycologists. Tasting and smelling mushrooms carries its own hazards because of poisons and allergens. Chemical tests are also used for some genera (Ammirati *et al.*, 1985).

In general, identification to genus can often be accomplished in the field using a local mushroom guide. Identification to species, however, requires more effort; one must remember that a mushroom develops from a button stage into a mature structure, and only the latter can provide certain characteristics needed for the identification of the species. However, over-mature specimens lose features and cease producing spores. Many novices have mistaken humid water marks on paper for white spore prints, or discolored paper from oozing liquids on lamella edges for colored spored prints.

#### **Classification**

A mushroom (probably *Russula brevipes*) parasitized by *Hypomyces lactifluorum*

resulting in a "Lobster mushroom". Typical mushrooms are the fruit bodies of members of the order Agaricales, whose type genus is *Agaricus* and type species is the field mushroom, *Agaricus campestris*. However, in modern molecularly defined classifications, not all members of the order Agaricales produce mushroom fruit bodies, and many other gilled fungi, collectively called mushrooms, occur in other orders of the class Agaricomycetes. For example, chanterelles are in the Cantharellales, false chanterelles such as *Gomphus* are in the Gomphales, milk - cap mushrooms (*Lactarius*, *Lactifluus*) and russulas (*Russula*), as well as *Lentinellus*, are in the Russulales, while the tough, leathery genera *Lentinus* and *Panus* are among the Polyporales, but *Neolentinus* is in the Gloeophyllales, and the little pin-mushroom genus, *Rickenella*, along with similar genera, are in the Hymenochaetales.

Within the main body of mushrooms, in the Agaricales, are common fungi like the common fairy-ring mushroom, shiitake, enoki, oyster mushrooms, fly agarics and other Amanitas, magic mushrooms like species of *Psilocybe*, paddy straw mushrooms, shaggy manes, etc. An atypical mushroom is the lobster mushroom, which is a deformed, ooked-lobster colored parasitized fruitbody of a *Russula* or *Lactarius*, colored and deformed by the mycoparasitic Ascomycete *Hypomyces lactifluorum* (Volk, 2001). Other mushrooms are not gilled, so the term "mushroom" is loosely used, and giving a full account of their classifications is difficult. Some have pores underneath (and are usually called boletes), others have

spines, such as the hedgehog mushroom and other tooth fungi, and so on. "Mushroom" has been used for polypores, puffballs, jelly fungi, coral fungi, bracket fungi, stinkhorns, and cup fungi. Thus, the term is more one of common application to macroscopic fungal fruiting bodies than one having precise taxonomic meaning. Approximately 14,000 species of mushrooms are described (Miles PG, Chang ST, 2004).

### Etymology

*Amanita muscaria*, the most easily recognised "toadstool", is frequently depicted in fairy stories and on greeting cards. It is often associated with gnomes. The terms "mushroom" and "toadstool" go back centuries and were never precisely defined, nor was there consensus on application. Between 1400 and 1600 AD, the terms *mushrom*, *mushrum*, *muscheron*, *mousheroms*, *mussheron*, or *musserouns* were used. The term "mushroom" and its variations may have been derived from the French word *mousseron* in reference to moss (*mousse*). However, delineation between edible and poisonous fungi is not clear-cut, so a "mushroom" may be edible, poisonous, or unpalatable. Cultural or social phobias of mushrooms and fungi may be related. The term "fungophobia" was coined by William Delisle Hay of England, who noted a national superstition or fear of "toadstools".

The word "toadstool" has apparent analogies in Dutch *padde(n)stoel* (toad-stool/chair, mushroom)

and German *Krötenschwamm* (toad-fungus, alt. word for panther cap). In German folklore and old fairy tales, toads are often depicted sitting on toadstool mushrooms and

catching, with their tongues, the flies that are said to be drawn to the *Fliegenpilz*, a German name for the toadstool, meaning "flies' mushroom". This is how the mushroom got another of its names, *Krötenstuhl* (a less-used German name for the mushroom), literally translating to "toadstool".

### Morphological characters

A mushroom develops from a nodule, or pinhead, less than two millimeters in diameter, called a primordium, which is typically found on or near the surface of the substrate. It is formed within the mycelium, the mass of threadlike hyphae that make up the fungus. The primordium enlarges into a roundish structure of interwoven hyphae roughly resembling an egg, called a "button". The button has a cottony roll of mycelium, the universal veil, which surrounds the developing fruit body. As the egg expands, the universal veil ruptures and may remain as a cup, or volva, at the base of the stalk, or as warts or volval patches on the cap. Many mushrooms lack a universal veil, therefore they do not have either a volva or volval patches. Often, a second layer of tissue, the partial veil, covers the blade-like gills that bear spores. As the cap expands, the veil breaks, and remnants of the partial veil may remain as a ring, or annulus, around the middle of the stalk or as fragments hanging from the margin of the cap. The ring may be skirt-like as in some species of *Amanita*, collar-like as in many species of *Lepiota*, or merely the faint remnants of a cortina (a partial veil composed of filaments resembling a spiderweb), which is typical of



the genus *Cortinarius*. Mushrooms lacking partial veils do not form an annulus.

The stalk (also called the stipe, or stem) may be central and support the cap in the middle, or it may be off-center and/or lateral, as in species of *Pleurotus* and *Panus*. In other mushrooms, a stalk may be absent, as in the polypores that form shelf-like brackets. Puffballs lack a stalk, but may have a supporting base. Other mushrooms, such as truffles, jellies, earthstars, and bird's nests, usually do not have stalks, and a specialized mycological vocabulary exists to describe their parts. The way the gills attach to the top of the stalk is an important feature of mushroom morphology. Mushrooms in genera *Agaricus*, *Amanita*, *Lepiota* and *Pluteus*, among others, have free gills that do not extend to the top of the stalk. Others have decurrent gills that extend down the stalk, as in the genera *Omphalotus* and *Pleurotus*. There are a great number of variations between the extremes of free and decurrent, collectively called attached gills. Finer distinctions are often made to distinguish the types of attached gills: adnate gills, which adjoin squarely to the stalk; notched gills, which are notched where they join the top of the stalk; adnexed gills, which curve upward to meet the stalk, and so on. These distinctions between attached gills are sometimes difficult to interpret, since gill attachment may change as the mushroom matures, or with different environmental conditions.

### Microscopic features

A hymenium is a layer of microscopic spore-bearing cells that covers the surface of gills. In the nongilled mushrooms, the hymenium lines the inner surfaces of the

tubes of boletes and polypores, or covers the teeth of spine fungi and the branches of corals. In the Ascomycota, spores develop within microscopic elongated, sac-like cells called asci, which typically contain eight spores in each ascus. The Discomycetes, which contain the cup, sponge, brain, and some club-like fungi, develop an exposed layer of asci, as on the inner surfaces of cup fungi or within the pits of morels. The Pyrenomycetes, tiny dark-colored fungi that live on a wide range of substrates including soil, dung, leaf litter, and decaying wood, as well as other fungi, produce minute, flask-shaped structures called perithecia, within which the asci develop.

In the Basidiomycetes, usually four spores develop on the tips of thin projections called sterigmata, which extend from club-shaped cells called a basidium. The fertile portion of the Gasteromycetes, called a gleba, may become powdery as in the puffballs or slimy as in the stinkhorns. Interspersed among the asci are threadlike sterile cells called paraphyses. Similar structures called cystidia often occur within the hymenium of the Basidiomycota. Many types of cystidia exist, and assessing their presence, shape, and size is often used to verify the identification of a mushroom.

The most important microscopic feature for identification of mushrooms is the spores. Their color, shape, size, attachment, ornamentation, and reaction to chemical tests often can be the crux of identification. A spore often has a protrusion at one end, called an apiculus, which is the point of attachment to the basidium, termed the

apical germ pore, from which the hypha emerges when the spore germinates.

### Growth and development

Many species of mushrooms seemingly appear overnight, growing or expanding rapidly. This phenomenon is the source of several common expressions in the English language including "to mushroom" or "mushrooming" (expanding rapidly in size or scope) and "to pop up like a mushroom" (to appear unexpectedly and quickly). In reality all species of mushrooms take several days to form primordial mushroom fruit bodies, though they do expand rapidly by the absorption of fluids.

The cultivated mushroom as well as the common field mushroom initially form a minute fruiting body, referred to as the pin stage because of their small size. Slightly expanded they are called buttons, once again because of the relative size and shape. Once such stages are formed, the mushroom can rapidly pull in water from its mycelium and expand, mainly by inflating preformed cells that took several days to form in the primordia. Similarly, there are even more ephemeral mushrooms, like *Parasola*

*plicatilis* (formerly *Coprinus plicatilis*), that literally appear overnight and may disappear by late afternoon on a hot day after rainfall.<sup>[13]</sup> The primordia form at ground level in lawns in humid spaces under the thatch and after heavy rainfall or in dewy conditions balloon to full size in a few hours, release spores, and then collapse. They "mushroom" to full size.

Not all mushrooms expand overnight; some grow very slowly and add tissue to their fruitbodies by growing from the edges of the

colony or by inserting hyphae. For example, *Pleurotus nebrodensis* grows slowly, and because of this combined with human collection, it is now critically endangered.<sup>[14]</sup>

Yellow flower pot mushrooms (*Leucocoprinus birnbaumii*) at various stages of development

Though mushroom fruiting bodies are short-lived, the underlying mycelium can itself be long-lived and massive. A colony of *Armillaria solidipes* (formerly known as *Armillaria ostoyae*) in Malheur National Forest in the United States is estimated to be 2,400 years old, possibly older, and spans an estimated 2,200 acres (8.9 km<sup>2</sup>). Most of the fungus is underground and in decaying wood or dying tree roots in the form of white mycelia combined with black shoelace-like rhizomorphs that bridge colonized separated woody substrates. It has been suggested the electrical stimulus of a lightning bolt striking mycelia in logs accelerates the production of mushrooms.

### Nutritional value of mushrooms

#### Nutritional value per 100 G (3.5 OZ)

Energy	94 kJ (22 kcal)
Carbohydrates	4.3 g
Fat	0.1 g
Protein	2.5 g

#### Vitamins (%dv) Qty

Thiamine (B1)	(9%) 0.1 mg
Riboflavin (B2)	(42%) 0.5 mg
Niacin (B3)	(25%) 3.8 mg
Pantothenic acid (B5)	(30%) 1.5 mg
Vitamin B6	(8%) 0.11 mg
Folate (B9)	(6%) 25 µg
Vitamin C	(0%) 0 mg
Vitamin D	(1%) 3 IU

#### Minerals

Calcium	(2%) 18 mg
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Iron	(3%) 0.4 mg
Magnesium	(3%) 9 mg
Manganese	(7%) 0.142 mg
Phosphorus	(17%) 120 mg
Potassium	(10%) 448 mg
Sodium	(0%) 6 mg
Zinc	(12%) 1.1 mg

**Other constituents**

Selenium 26 ug

Copper 0.5 mg

Vitamin D (UV exposed) 1276 IU

Units

µg = micrograms • mg = milligrams

IU = International units

†Percentages are roughly approximated using US recommendations for adults.

Source: USDA Nutrient Database

Raw brown mushrooms are 92% water, 4% carbohydrates, 2% protein and less than 1% fat. In a 100 gram (3.5 ounce) amount, raw mushrooms provide 22 calories and are a rich source (20% or more of the Daily Value, DV) of B vitamins, such as riboflavin, niacin and pantothenic acid, selenium (37% DV) and copper (25% DV), and a moderate source (10-19% DV) of phosphorus, zinc and potassium (table). Vitamin C and sodium have no or minimal content.

**Vitamin D**

The vitamin D content of a mushroom depends on postharvest handling, in particular the unintended exposure to sunlight. The US Department of Agriculture provided evidence that UV-exposed mushrooms contain substantial amounts of vitamin D. When exposed to ultraviolet (UV) light, even after harvesting, ergosterol in mushrooms is converted to vitamin D<sub>2</sub>, a process now used intentionally to supply fresh vitamin D mushrooms for the functional food grocery market. In a

comprehensive safety assessment of producing vitamin D in fresh mushrooms, researchers showed that artificial UV light technologies were equally effective for vitamin D production as in mushrooms exposed to natural sunlight, and that UV light has a long record of safe use for production of vitamin D in food.

**Edible mushrooms**

The *Agaricus bisporus*, one of the most widely cultivated and popular mushrooms in the world

Culinary mushrooms are available in a wide diversity of shapes and colors at this market stand at the San Francisco Ferry Building. Mushrooms are used extensively in cooking, in many cuisines (notably Chinese, Korean, European, and Japanese). Though neither meat nor vegetable, mushrooms are known as the "meat" of the vegetable world.

Most mushrooms sold in supermarkets have been commercially grown on mushroom farms. The most popular of these, *Agaricus bisporus*, is considered safe for most people to eat because it is grown in controlled, sterilized environments. Several varieties of *A. bisporus* are grown commercially, including whites, crimini, and portobello. Other cultivated species available at many grocers include *Hericium erinaceus*, shiitake, maitake (hen-of-the woods), *Pleurotus*, and enoki. In recent years, increasing affluence in developing countries has led to a considerable growth in interest in mushroom cultivation, which is now seen as a potentially important economic activity for small farmers.

China is a major edible mushroom producer. The country produces about half of all cultivated mushrooms, and around 2.7

kilograms (6.0 lb) of mushrooms are consumed per person per year by over a billion people. In 2014, Poland was the world's largest mushroom exporter, reporting an estimated 194,000 tonnes (191,000 long tons; 214,000 short tons) annually.

Separating edible from poisonous species requires meticulous attention to detail; there is no single trait by which all toxic mushrooms can be identified, nor one by which all edible mushrooms can be identified. People who collect mushrooms for consumption are known as mycophagists, and the act of collecting them for such is known as mushroom hunting, or simply "mushrooming". Even edible mushrooms may produce allergic reactions in susceptible individuals, from a mild asthmatic response to severe anaphylactic shock. Even the cultivated *A. bisporus* contains small amounts of hydrazines, the most abundant of which is agaritine (a mycotoxin and carcinogen). However, the hydrazines are destroyed by moderate heat when cooking.

A number of species of mushrooms are poisonous; although some resemble certain edible species, consuming them could be fatal. Eating mushrooms gathered in the wild is risky and should only be undertaken by individuals knowledgeable in mushroom identification. Common best practice is for wild mushroom pickers to focus on collecting a small number of visually distinctive, edible mushroom species that cannot be easily confused with poisonous varieties.

### **Poisonous mushrooms**

Many mushroom species produce secondary metabolites that can be toxic, mind-altering, antibiotic, antiviral, or bioluminescent. Although there are only a small number of deadly species, several others can cause particularly severe and unpleasant symptoms. Toxicity likely plays a role in protecting the function of the basidiocarp: the mycelium has expended considerable energy and protoplasmic material to develop a structure to efficiently distribute its spores. One defense against consumption and premature destruction is the evolution of chemicals that render the mushroom inedible, either causing the consumer to vomit the meal (see emetics), or to learn to avoid consumption altogether. In addition, due to the propensity of mushrooms to absorb heavy metals, including those that are radioactive, European mushrooms may, as late as 2008, include toxicity from the 1986 Chernobyl disaster and continue to be studied.

### **Psychoactive mushrooms**

Mushrooms with psychoactive properties have long played a role in various native medicine traditions in cultures all around the world. They have been used as sacrament in rituals aimed at mental and physical healing, and to facilitate visionary states. One such ritual is the *veladaceremony*. A practitioner of traditional mushroom use is the *shaman* or *curandera* (priest-healer). Psilocybin mushrooms possess psychedelic properties. Commonly known as "magic mushrooms" or "shrooms", they are openly available in smart shops in many parts of the world, or on the black market in those countries that have outlawed their sale. Psilocybin mushrooms have been reported as

facilitating profound and life-changing insights often described as mystical experiences. Recent scientific work has supported these claims, as well as the long-lasting effects of such induced spiritual experiences. There are over 100 psychoactive mushroom species of genus *Psilocybe* native to regions all around the world.

Psilocybin, a naturally occurring chemical in certain psychedelic mushrooms such as *Psilocybe cubensis*, is being studied for its ability to help people suffering from psychological disorders, such as obsessive-compulsive disorder. Minute amounts have been reported to stop cluster and migraine headaches. A double-blind study, done by the Johns Hopkins Hospital, showed psychedelic mushrooms could provide people an experience with substantial personal meaning and spiritual significance. In the study, one third of the subjects reported ingestion of psychedelic mushrooms was the single most spiritually significant event of their lives. Over two-thirds reported it among their five most meaningful and spiritually significant events. On the other hand, one-third of the subjects reported extreme anxiety. However, the anxiety went away after a short period of time.<sup>[37]</sup> Psilocybin mushrooms have also shown to be successful in treating addiction, specifically with alcohol and cigarettes.

A few species in the genus *Amanita*, most recognizably *A. muscaria*, but also *A. pantherina*, among others, contain the psychoactive compound muscimol. The muscimol-containing chemotaxonomic group of *Amanitas* contains no amatoxins or

phallotoxins, and as such are not hepatotoxic, though if not properly cured will be non-lethally neurotoxic due to the presence of ibotenic acid. The *Amanita* intoxication is similar to Z-drugs in that it includes CNS depressant and sedative-hypnotic effects, but also dissociation and delirium in high doses.

#### **Medicinal properties of mushrooms**

Some mushrooms are used or studied as possible treatments for diseases, particularly their extracts, including polysaccharides, glycoproteins and proteoglycans. In some countries, extracts of polysaccharide K, schizophyllan, polysaccharide peptide, or lentinan are government – registered adjuvant cancer therapies, even though clinical evidence of efficacy in humans has not been confirmed. Historically in traditional Chinese medicine, mushrooms are believed to have medicinal value, although there is no evidence for such uses.

#### **Other uses of mushrooms**

Mushrooms can be used for dyeing wool and other natural fibers. The chromophores of mushroom dyes are organic compounds and produce strong and vivid colors, and all colors of the spectrum can be achieved with mushroom dyes. Before the invention of synthetic dyes, mushrooms were the source of many textile dyes.

Some fungi, types of polypores loosely called mushrooms, have been used as fire starters (known as tinder fungi). Mushrooms and other fungi play a role in the development of new biological remediation techniques (e.g., using mycorrhizae to spur plant growth) and filtration technologies (e.g. using fungi to lower bacterial levels in contaminated water).

## पलाश : औषधीय गुणों वाला एक दुर्लभ वृक्ष

रविशंकर मडावे<sup>1</sup> एवं मंसूर अहमद<sup>2</sup>

<sup>1</sup>अकाष्ठ वन उत्पाद प्रभाग

उष्णकटिबंधीय वन अनुसंधान संस्थान

(भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार)

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उष्णकटिबंधीय वन अनुसंधान संस्थान

(भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार)

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### सारांश

पलाश सुंदर फूलों वाले प्रमुख भारतीय वृक्षों में से एक है। भारतीय साहित्य और संस्कृति से घना संबंध रखने वाले इस वृक्ष का चिकित्सा और स्वास्थ्य से गहरा संबंध है। यह भारत, दक्षिणपूर्वी एशिया --बांग्लादेश, नेपाल, पाकिस्तान, थाईलैंड, कम्बोडिया, मलेशिया श्रीलंका और पश्चिम इंडोनेशिया में बहुतायत में मिलता है। बसंत में खिलना प्रारम्भ करने वाला यह वृक्ष गर्मी की प्रचंड धूप में भी अपनी छटा बिखेरते देखा जा सकता है। यह उस समय अपने सर्वोत्तम रूप को भी प्रदर्शित करता है। ऋतुराज बसंत के स्वागत का प्रमुख श्रेय लाल रंग से आवृत्त पलाश वृक्ष को ही जाता है। आवश्यकताओं की पूर्ति हेतु किए जा रहे अधिकाधिक उपयोग से इसकी संख्या लगातार घट रही है।

### प्रस्तावना

#### उत्पत्ति और वितरण

ऐतिहासिक, साहित्यिक तथा औषधीय रूप से महत्वपूर्ण कुल फैबेसी (*Fabaceae*) का वृक्ष पलाश सामान्यतः उष्ण तथा उपोष्णकटिबंधीय क्षेत्रों, भारतीय उपमहाद्वीपीय भागों और दक्षिणपूर्व एशिया में मिलता है। इसके विभिन्न नाम हैं। पलाश को हिंदी में टेसू, केसू, ढाक या पलाश, गुजराती में

खाखरी या केसुदो, पंजाबी में केशु, बांग्ला में पलाश या पोलाशी, तमिल में परसु या पिलासू, उड़िया में पोरसू, मलयालम में मुरक्कच्यूम या पलसु, तेलुगु में मोदूगु, मणिपुरी में पांगोंग, मराठी में पलस और संस्कृत में किंशुक नाम से जाना जाता है। पलाश संस्कृत भाषा के शब्द पल और आश से मिलकर बना है, पल = मांस, अश = खाना। अर्थात् वह वृक्ष जिसने मांस खाया हो।

गंगा यमुना के विस्तृत क्षेत्रों से मध्यप्रदेश तक इनके जंगल में पाये जाने की पुष्टि होती है। 19 वीं शताब्दी में हुई अंधाधुंध कटाई के कारण अब ये वृक्ष बहुत कम स्थानों पर ही दिखाई देते हैं। इसके ब्यूटिया नाम की उत्पत्ति 18 वीं शताब्दी में वर्गिकी के एक संरक्षक ब्यूट के अर्ल जोहन की स्मृति में हुई थी। शब्द मोनोस्पर्मा ग्रीक भाषा से लिया गया है, जिसका अर्थ है एक बीज वाला।

इसकी अन्य जातियाँ ब्यूटिया सुपरबा और ब्यूटिया पार्वीफ्लोरा (*B. parviflora* and *B. superba*) आदि हैं।

#### पलाश वृक्ष के प्रमुख अंग

##### तना

मध्यम आकार का 12) से 15 मीटर लंबा (यह वृक्ष सीधा, अनियमित शाखाओं और खुरदुरे तने वाला होता है) चित्र(4। पल्लव धूसर या भूरे रंग के रेशमी

और रोयेंदार प्रतीत होते हैं। इसकी छाल का रंग राख की तरह होता है। इसकी बढवार बहुत धीमी होती है। पलाश का छोटा वृक्ष प्रति वर्ष लगभग एक फुट तक बढ जाता है। पूर्ण रूप से खिलने के बाद जब यह वृक्ष अपने सारे पत्ते गिरा चुका होता है तब इसके सुशोभित फूल अनूठी रचना बनकर प्रकृति में इस प्रकार खिल उठते हैं मानो बेरंग मौसम में रंग भर रहे हों।

**पत्तियाँ**

पत्तियाँ बड़ी और तीन की संख्या में एक



ही वृंत पर निकलती हैं।) ढाक के तीन पात मुहावरा इसी से निकला है। (वृंत लगभग 15-10 से.मी .लंबा होता है। ये पत्ते सामने से गोल, ऊपर की ओर रोम रहित, पतले चिकने, मजबूत और त्रिकोणाकार होते हैं। नीचे की ओर इनमें नसें होती हैं। इसका आकार लगभग 15-12 से.मी .होता है। दिसंबर से जनवरी इसके पतझड़) पत्तियों के गिरने का समय (होता है। इस समय इसकी भूरी टेढीमेढी डालियों को बिना पत्तों के देखा जा सकता है।

**फूल**

पलाश की कलियाँ काले भूरे रंग की घनी और मखमली होती हैं और इनके बाह्यसंपुट का रंग जैतून

की भांति हरे रंग से लेकर भूरे रंग तक अनेक छवियों में दिखाई देता है। इनकी त्वचा मखमली मुलायम होती है। पूरी तरह से खिलने के बाद लाल नारंगी रंग का छत्र पूरे वृक्ष को ढँक लेता है ।



इस समय यह वृक्ष अपने सबसे सुंदर रूप में दिखाई देता है। इसके गंधहीन फूल, 15सेमी लंबे हरे वृंतों के सिरे पर गहरे हरे मखमली प्यालेनुमा कठोर पुटकों पर घने लाल गुच्छों में खिलते हैं और दो गहरे विपरीत रंगों की आकर्षक छटा बिखेरते हैं। इनका रंग लाल नारंगी या पीला तथा आकार लगभग 2 इंच का होता है। इसके प्रत्येक फूल में पाँच पंखुडियाँ होती हैं। दो सामान्य पंखुडियाँ जो जोड़कर बनी एक चौड़ी पंखुडी) Standard(, दो छोटी पंखुडियाँ )Wings (और एक तोते की चोंच के जैसी लंबी घूमी हुई पंखुडी) कील (होती है इसी आकृति के कारण ही इसे संस्कृत में किंशुक) हिंदी में अर्थ तोते जैसी रचना) कहा जाता है।

पलाश के सुंदर फूल फरवरी माह से आना शुरू हो जाते हैं और अप्रैल तक बने रहते हैं। इसकी पत्रविहीन डालों पर लाल नारंगी रंग के समूह में खिले हुए इनके घने गुच्छे दूर से देखने पर ऐसे दिखाई देते हैं मानो जंगल में आग) Flame of

Forest (लगी हो। इसका पुष्पदल, लाल नारंगी रंग का, आकार में लंबा, बाहरी ओर रेशमी रजत रोम वाला होता है। दो पुंकेसर आपस में जुड़े होते हैं और पराग कोश एक समान होते हैं। पुंकेसर की इस खास संरचना को द्विसंघी पुंकेसर कहा जाता है। इस विशेष गुण के कारण ब्यूटिया या पलाश को फली के परिवार में रखा गया है। अंडाशय में दो अंडाणु वाले, वर्तिका सूत्राकार गोल जुड़ी होती है और



वर्तिकाग्र आकर्षक होता है।

**फलियाँ**

चमकीली-धूसर रंग की फली लगभग 15 सेमी लंबी, 5-3से.मी .आकार में पतली-चपटी परंतु संधिस्थल पर यह मोटी होती है। छोटी फली पर बहुत से रोएँ होते हैं जो उसकी त्वचा को मखमली और मुलायम बनाते हैं। परिपक्व फलियाँ शिब की तरह शाखाओं से लटकती हैं। बीज चपटे 40-25 मि.मी .लंबे, 15से 25मि.मी .चौड़े और 2.0-1.5 मि.मी .मोटे, गुर्दे के आकार के चपटे व गोलाकार होते हैं। इनका बाहरी आवरण लाल कथई, चमकदार और खुरदुरा, ऊपर से गोलाकार विभाजित और नीचे से जुड़ा हुआ, दो बड़े पीली आभा वाले पत्तेंदार बीजपत्रों से जुड़ा होता है। बीज की नाभिका जो बीज पर आँख की

तरह दिखाई देती है सुस्पष्ट और बीज के निचले सिरे के मध्य में होती है। बीज अधिक नमक वाली मिट्टी में अंकुरित हो जाते हैं लेकिन नमक का सीधा छिड़काव इनके अनुकूल नहीं है। इससे वृक्ष की पत्तियाँ जल जाती हैं। इनमें गंध बहुत हल्की और स्वाद हल्का तीखा और कड़वा होता है।

**रासायनिक संघटक**

पलाश के फूलों में %1.5 आइसोब्यूट्रिन, %0.37 ब्यूटेइन और %0.04 ब्यूट्रिन संघटक के अतिरिक्त फ्लेवोनाइड और स्टेरायड भी पाए जाते हैं। पूर्व में किए गए शोध से ज्ञात होता है कि फूल के सूखने पर आइसोब्यूट्रिन धीरे-धीरे ब्यूट्रिन में परिवर्तित हो जाता है। कोरोपसिन, ईसोकोरोपसिन, सल्फ्यूरिन )ग्लाइकोसाइड (मोनोसोर्मोसाइड और ईसोमोनोसोर्मोसाइड भी इन फूलों में पाये जाते हैं। पलाश की जड़ों में ग्लूकोज, ग्लिसरीन, ग्लूकोसाइड और सुगंधित यौगिक भी पाये जाते हैं। इसकी बीजों में तेल की मात्रा और फूलों का लाल रंग इनमें पाए जाने वाले चाकोन और औरोन्स के कारण होता है।

**औषधीय उपयोग**

आयुर्वेद में पलाश को विशेष औषधीय गुण रखने वाला वृक्ष बताया गया है। इसका सम्पूर्ण वृक्ष) तना, जड़, फल, फूल तथा बीज (औषधि बनाने हेतु उपयोग में लाया जाता है। पलाश गोंद या कमरकस में गैलिक और टैनिन अम्ल पर्याप्त मात्रा में होता है। पलाश गोंद का उपयोग दवाओं में और विभिन्न व्यंजन बनाने में किया जाता है। इसकी गोंद को बंगाल में किनो नाम से भी जाना जाता है और डायरिया व पेचिश जैसे रोगों की चिकित्सा में प्रयोग किया जाता है। पलाश के बीज त्वचा संबंधी बीमारी में लाभप्रद पाए गए हैं। इसके बीजों को नींबू के रस के साथ पीस कर खुजली, एक्जिमा तथा दाद जैसे रोगों को दूर करने के काम में लिया जाता है। पेट में मौजूद कीड़ों से मुक्ति के लिये शहद के



साथ पेस्ट बना कर अथवा पीस कर पाउडर की तरह सेवन करने से आराम मिलता है। पलाश के पत्तों को त्वचा के छालों तथा सूजन पर लगाना बहुत लाभदायक है। इसकी पत्तियाँ रक्त शर्करा (Blood Sugar) को कम करती है तथा ग्लूकोस्यूरिया) पेशाब में ग्लूकोज़ की अत्यधिक मात्रा (को नियंत्रित करती है इसलिये मधुमेह की बीमारी में यह बहुत आराम देती हैं। पत्तियों के काढ़े को ल्युकोरिया की बीमारी में भी काम में लिया जाता है। पत्तियों को पानी के साथ उबाल कर माउथवाश की तरह उपयोग में लाना खराश तथा जकड़न में बहुत आराम देता है। पलाश की जड़ें फ़ीलपाँव, रतौंधी और अन्य दृष्टि दोष के इलाज में भी उपयोग में लायी जाती हैं।

#### सामाजिक महत्त्व

ग्रामीण क्षेत्रों में प्राचीन समय से पलाश के पत्तों का उपयोग खाना परोसने हेतु पत्तल के रूप में किया जाता है। इसकी लकड़ी को इमारती सामान बनाने तथा ईंधन के रूप में भी उपयोग में लाया जाता है साथ ही इसके फूलों से होली के समय पारम्परिक रूप से रंग भी बनाया जाता है। पलाश के वृक्ष को पूर्वा फल्गुनी नक्षत्र का प्रतीक माना जाता है। इससे लोगों की आस्था जुड़ी है मान्यता है कि पूर्वा फल्गुनी नक्षत्र में जन्म लेने वाले लोगों को पलाश वृक्ष की पूजा करने से सुख समृद्धि प्राप्त होती है। पश्चिमी बंगाल में इसे वसंत और होली का प्रतीक माना गया है। कुछ लोगों का मानना है कि इस फूल का पलासी नाम इतिहास प्रसिद्ध पलासी के युद्ध के कारण पड़ा है। आंध्र प्रदेश के तेलंगाना क्षेत्र में शिवरात्रि के दिन शिव की पूजा में पलाश के फूल अर्पित करने की परंपरा है। केरल राज्य में इसे चमटा नाम से भी पुकारा जाता है। चमटा शब्द संस्कृत के 'समिधा' का मलयालम तद्भव रूप है, इसके अनुसार अग्निहोत्र में पलाश की समिधा का प्रयोग होता है। मणिपुर में यदि मेइति समाज के

किसी व्यक्ति की मृत्यु हो जाती है और उसकी मृत देह प्राप्त नहीं हो पाती तो उस व्यक्ति के स्थान पर पलाश की एक शाखा को जलाकर अंतिम संस्कार कर दिया जाता है।

#### संरक्षण

जैसा कि उपरोक्त वर्णित है, दैनिक जीवन में उपयोगी गुणकारी पलाश की संख्या निरंतर कम



होती जा रही है। इसका होना न केवल पर्यावरणीय, सामाजिक बल्कि आर्थिक दृष्टिकोण से भी बहुत महत्वपूर्ण है। जिस तीव्र गति से इसका दोहन हो रहा है कम समय में ही इसकी संख्या समाप्त होने की कगार पर पहुँच सकती है। वृक्षारोपण तथा जन जागरूकता द्वारा ही हम इसके महत्व को दूसरों को बताकर इसके संरक्षण हेतु प्रयास कर सकेंगे तथा आने वाले समय में पुनः इस वृक्ष को अन्य उपयोगी वृक्षों की संख्या के समतुल्य कर पाएँगे।

## सीबकथोर्न: स्टोर हाउस ऑफ विटामिन्स

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इलेगनेसी कुल की जाति हिप्पोफी के पौधे सामान्यतः सीबकथोर्न के नाम से जाने जाते हैं। यह 'सुनहली झाड़ी' और 'स्टोर हाउस ऑफ विटामिन्स' के नाम से भी प्रसिद्ध हैं क्योंकि इसके फलों में विटामिन- सी, ए, बी, के तथा ई की प्रचुर मात्रा होती है। यह हिमालय के शीत मरुस्थल क्षेत्रों में पाया जाने वाला आश्चर्यजनक एवं आकर्षक लघु वृक्ष या झाड़ी है। जैसा कि इसके नाम 'सीबकथोर्न' नाम से विदित होता है यह समुद्रतल से लेकर अधिक ऊँचाई वाले पर्वतीय क्षेत्रों तक पाया जाता है। हिप्पोफी के लघु वृक्ष (03 से 10 मीटर तक ऊँचे) या झाड़ियाँ समुद्री

तटों पर श्रेष्ठ वायुरोधक के रूप में पहचाने जाते हैं तथा उत्तर-पश्चिमी हिमालय की शुष्क शृंखलाओं में नदी किनारे मिलते हैं। यूरोप एवं एशिया के मूल निवासी हिप्पोफी की चाइना सहित 30 से अधिक देशों में उपस्थिति दर्ज की गई है। भारत में इसकी तीन प्रजातियाँ हिप्पोफी रेहमनाँइडिस, हि. सेलिसिफोलिआ तथा हि. तिबिताना 800 से 4500 मीटर तक की ऊँचाई पर बिखरी हुई है परन्तु ट्रान्स हिमालय के लद्दाख (जम्मू एवं कश्मीर), लाहौलस्पीती (हिमाचल प्रदेश), कुमाँऊ एवं गढ़वाल (उत्तराखण्ड), सिक्किम एवं अरुणाचल प्रदेश में विस्तृत रूप से पायी जाती है। इनमें हिप्पोफी रेहमनाँइडिस सबसे लोकप्रिय प्रजाति है। अलग-अलग देशों में सीबकथोर्न अपने भिन्न-भिन्न गुणों के कारण पारिस्थितिकीय गतिविधियों के अंतर्गत लगाया जा रहा है जैसे कुछ देशों में इसे पार्क व बगीचों में शोभादार वृक्षों या झाड़ियों के रूप में, कुछ देशों में इसके स्वादिष्ट एवं पौष्टिक फलों को फार्मास्युटिकल उद्योग के लिए तथा जर्मनी के बाल्टिक क्षेत्र में इसे इसकी दूर तक फैली हुई जड़ों द्वारा समुद्रतटीय रेत के टीलों को बांधने के लिए लगाया जा रहा है।

### आकारकीय

हिप्पोफी का तना सीधा होता है जिस पर नुकीले कांटे होते हैं। आधार से बहुत सी शाखाएँ निकलती हैं। शाखाओं तथा उपशाखाओं पर भी कांटे होते हैं। छाल खुरदरी तथा कथई रंग की होती है। पत्तियाँ छोटी, रैखिक (लीनियर-लेंसीओलेट) व हरे रंग की होती है। पत्तियों की ऊपरी व निचली सतह पर सिल्वरी शल्पपत्र होते हैं। माह मार्च-अप्रैल के दौरान हरे से या पीले रंग

के बहुत छोटे-छोटे पुष्प नयी पत्तियों के साथ निकलते हैं। हिप्पोफी का पौधा यूनीसेक्सुअल तथा डायोसियस होता है। नर एवं मादा पुष्प अलग-अलग झाड़ियों पर पाये जाते हैं। पुष्प पहली वाली वृद्धि प्राप्त शाखाओं पर रेसीम पुष्पक्रम में लगे रहते हैं। नर पुष्प कक्षस्थ गुच्छे में तथा मादा पुष्प एकल रूप में होते हैं। मादा पुष्पों का डंठल कांटे या उपशाखा में विकसित हो जाता है, जबकि नर पुष्प झड़ जाते हैं। फल (बेरि) अण्डाकार (ओवॉइड), चमकीले नारंगी-पीले या लाल रंग के होते हैं। बीज लम्बे एवं अण्डाकार (ओब्लान्ग) तथा बीज कवच क्रस्टेसियस एवं चमकदार होता है। फल प्राप्ति हेतु नर एवं मादा पौधों की आवश्यकता होती है। एक नर पौधे से लगभग छः-सात मादा पौधों में परागण हो जाता है। लकड़ी पीले-कथई रंग की एवं कठोर होती है। जड़ें दूर तक विस्तृत रूप से फैली रहती हैं।

#### प्रजनन एवं जलवायु

सीबकथोर्न के पौधे बीज या शाखाओं के टुकड़े (कटिंग्स) से तैयार किये जाते हैं। यह समुद्री क्षेत्रों तथा अन्य जगहों की रेतीली मिट्टी में बहुत अच्छी वृद्धि करता है। इसे पानी के उचित निकास वाली किसी प्रकार की भूमि में लगाया जा सकता है। पौधों में कटाई-छटाई (प्रूनिंग) की आवश्यकता नहीं होती है।

#### गुण

सीबकथोर्न के महत्वपूर्ण गुण इस प्रकार हैं:

1. सीबकथोर्न के पौधे श्रेष्ठ वायु अवरोधक हैं।
2. इसमें पाला सहने की अद्भुत क्षमता होती है।
3. यह तापमान की चरम श्रृंखला -40 डि.सें. से 40 डि.से. तक वृद्धि कर सकता है।
4. यह शुष्क दशाओं को भी अच्छी तरह ग्रहण कर लेता है।
5. इसकी दूर तक फैली हुई जड़ें मिट्टी तथा रेत को बांधे रखती हैं जिससे

यह खड़ी ऊँचाई, बंजर, ढलुआ भूमि तथा निम्नकोटि (डिग्रेडेड) की भूमि में मिट्टी के क्षरण को रोकता है।

6. इसकी जड़ों में पायी जाने वाली गांठों में फ्रेंकिया जाति का बैक्टीरिया सहजीवी के रूप में रहता है जिससे इसमें प्रतिवर्ष प्रति हेक्टेयर 180 कि.ग्रा. वायुमण्डलीय नाइट्रोजन को मिट्टी में स्थिर करने की क्षमता होती है।

#### उपयोग

बहुउपयोगी गुणों के कारण सीबकथोर्न फार्मास्युटिकल, भोज्य उत्पाद व सौंदर्य प्रसाधन बनाने वाले उद्योगों को आधारभूत कच्चा माल उपलब्ध कराता है:

1. इसके स्वादिष्ट एवं पौष्टिक फलों में अन्य फलों एवं साग-सब्जियों की तुलना में विटामिन सी प्रचुर मात्रा में पाया जाता है। विटामिन सी के अलावा फलों में विटामिन ए, बी, के तथा ई भी बहुत अधिक मात्रा में पाये जाते हैं।
2. फलों में शर्करा, कार्बनिक अम्ल, कैरोटिनाइड्स, एन्टीआक्सीडेंट, फ्लेबोनाइड्स, ग्लाइकोसाइड्स, स्टीरॉल्स तथा बहुत से जैवसक्रिय (बायोएक्टिव) यौगिक पाये जाते हैं।
3. पत्तियों में बहुत से पौष्टिक व जैवसक्रिय (बायोएक्टिव) पदार्थ पाये जाते हैं जिससे ये हर्बल चाय के रूप में उपयोग की जाती हैं।
4. पत्तियाँ चारे के रूप में उत्तम पशु आहार हैं।
5. लकड़ी जलाऊ ईंधन व कोयला बनाने के काम आती हैं।

#### औषधीय उपयोग

सीबकथोर्न का विभिन्न रोगों के उपचार में उपयोग किया जाता है। इसके औषधीय गुणों का

आयुर्वेद तथा भारतीय हिमालयन क्षेत्र की औषधीय पद्धति में विस्तृत वर्णन है:

1. इसके फलों तथा बीजों में पाये जाने वाले तेल में पराबैंगनी किरणों को अवशोषित करने का अतुलनीय गुण होता है।
2. यह तेल त्वचा के जले हुए भाग पर लगाने, एकजीमा तथा विकिरण संबंधी घावों आदि पर लगाने के काम आता है।
3. यह तेल हृदय संबंधी विकारों के उपचार में लाभदायक है।
4. इस तेल को आंतरिक रूप में आमाशय व आंत संबंधी रोगों के उपचार में उपयोग किया जाता है।
5. फलों से तैयार सीरप, फेफड़ों से संबंधित विकारों में उपयोगी है।
6. काढ़ा त्वचा संबंधी रोगों में लाभकारी है।

**अनुसंधान आवश्यकता**

उपरोक्त तथ्यों को ध्यान में रखते हुए हिप्पोफी रेहमनाईडिस तथा हि. सेलिसिफोलिया के बीजों के एक साथ व अधिक से अधिक अंकुरण के लिए बीजों के एकत्रीकरण समय, बीजों का रख-रखाव, बुआई पूर्व बीजोपचार, तथा लम्बी अवधि तक बीजों की उत्तरजीविका के लिए भण्डारण की उचित दशाओं जैसे- बीजों की नमी, भण्डारण

पात्र एवं भण्डारण के समय आवश्यक तापमान आदि पर अनुसंधान की आवश्यकता है, जिससे वृक्षारोपण के लिए रोपणी में उत्तम पौध प्राप्त की जा सके।

औषधीय एवं पौष्टिक गुणों के कारण रूस व चीन के बाजारों में सीबकथोर्न के 200 से अधिक उत्पाद औषधियों, सौंदर्य प्रसाधन, भोज्य उत्पाद, पेय पदार्थ आदि के रूप में उपलब्ध है। भारतीय बाजारों में इसके फलों से बने हर्बल पेय लेह बेररि, लद्दाख बेररि, पॉवर बेररि आदि के नाम से लोकप्रिय है। इसकी पत्तियों से तैयार की गई हर्बल चाय की दिनों-दिन मांग बढ़ती जा रही है। पिछले कुछ दशकों में इसके बहुउपयोगी गुणों को देखते हुए वैज्ञानिकों और नीति निर्माताओं द्वारा इसके पारिस्थितिक व व्यापारिक महत्व को मान्यता दी गई है। अतः इसके पारिस्थितिकीय पुनर्वास उत्पादों के वाणिज्यीकरण के लिए इसका हिमालय के शीत मरुस्थलीय क्षेत्रों में रहने वाले जनसमुदाय के सामाजिक-आर्थिक उत्थान के लिए अनुमोदन किया गया है। बाड़ी के रूप में हिप्पोफी की प्रजातियाँ विश्व के अनेक देशों में लगाई जा रही हैं।

## Know Your Biodiversity

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### *Grewia optiva*



*Grewia optiva* is one of the important multipurpose tree species and commonly used as fodder due to its excellent fodder quality. It belongs to order Malvales and family Tiliaceae. The tree is commonly known as Bihul, Biul and Bhimal. The genus *Grewia* was named after Nehemiah Grew (1641-1712), one of the founders of plant physiology. This is a tree of subtropical climate and grows on a variety of soils but sandy loam soil with adequate moisture is the ideal one for this tree. It is not a common forest tree and mostly found planted near the villages and along agriculture field boundaries. It is distributed in North-Western Himalayas in India, Nepal, Pakistan and Bhutan at an altitude of 500 to 2000 m. It is native to India and found in Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Punjab and Sikkim areas.

It is a moderate size deciduous tree with a short straight trunk and spreading crown. It reaches a height up to 9-12 m and a girth of about 80 cm. Branches are smooth and pale silvery brown in color. Bark is thick & roughish and dark brown in color. Leaves are opposite 5-8 cm in length and ovate and acuminate in shape. Leaves are rough and hairy above with smooth and soft surface below. Old leaves are shed in March and April and new ones appear in April-May. Flowers are borne 1-8 together, on a solitary stalk opposite the leaf and are large yellowish in color. Sepals are 1-1.5 cm long and green in color from outside and white, pale yellow or red inside. Petals are white or pale yellow in color and shorter than sepals in size. Flowers appear along with new flush of leaves followed by formation of fruits. The fruits are borne on previous years shoot. Fruits green in color when immature but turn into black on ripening. There are 2-4 seeds in a fruit. Flowering and fruiting period is April to November.

Traditionally Bihul is grown for fodder, fuel and fiber and considered as important agroforestry tree in hills and it is commonly found associated with crop fields or open forest. Leaves are rich in protein and other nutrients and do not contain tannins. The leaves are rated as good fodder it is generally used as a fodder during the winter season when other fodder availability is low in quantity. Therefore farmers lop this tree to feed their cattle and buffaloes. The dried wood is

used as fuel. The timber is used for oar shafts, poles, frames, tool handles, bows, paddles, tools and axe handles. Its branches are also used for making baskets which plays important role in livelihood for poor people. The soaked branches are beaten and fiber is extracted. Fibers are crushed to paste and mixed with hot water and used as shampoo by local ladies (especially in some parts of Uttarakhand) for washing hairs. Fiber obtained from the bark is used in paper and rope making. Bihul fibers are also used as light source (Mashal) to move from one place to another at night.

Crushed bark extract taken for indigestion and gastric problem and also used as lubricant during difficult childbirth. It is used to cure diarrhea, Malaria, Typhoid, fever, dysentery, smallpox and bladder & intestinal problems. Fresh leaves are boiled in water to prepare decoction which is further concentrated at low temperature and used to cure joint pains. Branches of the tree are cut during winter season and dipped in water for a month. Fruits are edible and used for fever. Fruits have commercial value and used to cure stomach and skin diseases. Paste of the seed mixed with a glass of hot milk is given to pregnant ladies to facilitate easy delivery.

It is considered as one of the most sustainable tree in low and mid hill regions of western and central Himalaya on account of its utility as fodder, fuel, fiber etc. It is very popular agro-forestry fodder tree species because it not only fulfills the need of fodder, fuel and medicines but also plays important role in amelioration of soil. It has ability to tolerate heavy pruning, pollarding and has good coppicing power. The tree is easily propagated from cuttings or from seeds.

Due to these characteristics it can establish itself in different climatic conditions and don't need much management. In low crop and fodder production areas it has great potential in improvement of livelihood of locals hence we need to promote plantation of this species especially in wastelands and field bunds.

#### *Coturnix coturnix*



*Coturnix coturnix* is a migratory bird commonly known as Common quail or European quail. It belongs to order Galliformes and family Phasianidae. The genus name *Coturnix* is the Latin word meaning Common quail. It is often confused with *Coturnix japonica* because of similar in appearance. Wetherbee and Jacobs (1960) called it the *Drosophila* of avian laboratory.

It is distributed in Europe, Turkey, and central Asia to China. This quail has also been found to reside in many parts of Africa, including Tanzania, Malawi, Kenya, Namibia, Madagascar, and the area of the Nile River Valley extending from Kenya to Egypt. In India it is found in Western and Central Himalaya. They dwell in grasslands and cultivated fields. It feeds on seeds and insects on the ground. It is an exclusively nocturnal migratory and movements are influenced by rainfall patterns. Just before migration, birds undertake a hyperphagic phase, in which they eat as much as is possible in order to build up reserves. At 42 km/h (the average speed measured for daytime flights), a

Quail can travel a maximum distance of 160-50 kms per night.

It is a small round bird having length 18.0–21.9 cm and weighs 91–131 g. The wing length of males is 110 to 115 mm and 107 to 116 mm for females. The tail measures 31 to 38 mm for males and 36 to 44 mm for females. Male have double collar with black band down middle of throat. Above brown with yellow shaft streaks, black patches and cross mark and blackish chin. Male has rufous-buff breast with white shaft streak, whitish abdomen. Female is larger than male with brown spot on breast. They have feathers on chin and rounded short throat. Legs of *Coturnix* are fleshy pink. Feet are slender with sharp narrow claws well suited for scratching at soil for seed and insects.

Mating system is monogamous and breeding season varies in its zone of occurrence. In Europe the breeding season is from mid-May to late August; in Africa, breeding occurs from September to March, although in Kenya they breed during the wet season, from January to February. Common quail may have up to three clutches per season. Upon attaining an age of 6–8 weeks, this quail breeds on open arable farm land and grassland. It lays 8-13 eggs. Eggs are pure white and approximately 2.5 cm in length and 8.5 g in weight. Incubation time is 17 to 20 days. The young quail are able to fly when they are eleven days old. The nest consists of a scrape with grassy material added and is found in herbaceous vegetation or grasses.

It is one among the edible birds because of its nutritious meat and eggs. Quail meat has many nutrients contents such as rich in protein, vitamins, phosphorus, fat, calcium, iron and zinc. Its egg also contains high protein and choline that is

very good for brain. Egg yolk also contains lutein and zeaxanthin which is good for healthy retina. Its meat is also consumed to cure skin problems, Bone problems, asthma, tuberculosis, and vegetative vascular dystrophy.

This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km<sup>2</sup> combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size is extremely large, and hence does not approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern in IUCN Red list threat category. Although its population seems stable but in European countries its population is declining and needs conservation. The common quail is heavily hunted, particularly along its migration routes for its meat. Beside this its habitat is also affected by agricultural intensification in its zone of occurrence by changes in farming practices, loss of uncultivated land, increase use of herbicides and insecticides. In addition to these predation and genetic pollution from released Japanese and/or hybrid Quails also affect the population of these species. Hence

long term population monitoring coupled with ecological studies and complete ban on its hunting is needed for its conservation.

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